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The Pattern of Crimes in Madras City

Some Random thoughts on Population and Regional Development

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EDITORIAL – SOME HIGHLIGHTS

State

Climate and Prices

The weather in October was cloudy for most of the time, with bouts of rain, at the tail end of the south west monsoon. The south west monsoon in the state was satisfactory and the hydel reservoir have reached a satisfactory level as the last two issues of the Bulletin have stated. Towards the end of the third week of October the north east monsoon commenced - on time and within the week the state has received widespread rains. Both agriculture and the drinking water facilities are benefiting from this timely outbreak of the monsoon. The depression in the Bay which brought heavy rain has added 184 mcft (one month supply) to Red Hills. On prices, there is no report beyond that for June 1991 analysed in the last issue, except the government decision to extend till November the increased allotment through the Public Distribution System (PDS) of rice, wheat and sugar as a means of keeping fair prices under control. 30,000 tonnes of Palmolein is being imported by the Union and will also be distributed through the PDS, with 3000 tonnes for the state as a first instalment.

Power

The power situation in October in the state was normal. On the supply side, there were 3 positive developments in October. First, the second thermal plant at Neyveli increased its power generation, with its third and fourth units which had been repaired and set right generating 377 MW - (the third unit infact generating 2 MW more than its capacity of 210MW) - and the flow in all 4 units generating 762 MW against its capacity of 840MW. Second, the Tamil Nadu Electricity Board is taking advance action to avoid the kind of crisis caused by the shortage of coal stocks reported earlier, (See Vol XXI pp2,154 and 208) and is building up coal stocks from the current 7 lakh tonnes to 10 lakh tonnes against the onset of the North East monsoon, which has just broken. The problem with coal supply is that it has to

be transported a long way from Bihar or Bengal and on top there is the problem of industrial unrest which disrupted the supply through ships in the Madras harbour during the month. The situation was saved, with the navy helping to unload the coal stocks from the ships. One good result of these difficulties is the conjunctive use of hydel source in the state due to the adequate water storage in the hydel reservoirs. Third, the Assembly was informed that the states power gap will be 1700 MW in 1995 and 4300 MW in 2000 and for which some large new power projects have to be planned like the North Madras thermal and the Narimanam gas which has large potential. For the present, work is underway on projects to generate 119 MW by 1995. This includes the underground power house at Pykara to generate 150 MW thorough 3 x 50 MW units of which the first unit will be ready in 1997, a 7.5 unit at Sathanur from the irrigation dam there and which will be completed by 1995, and the two tiny hydel projects to generate 4 MW cr the lower Bhavani right canal. To streamline the distribution system, 37 substations are being erected this year. The Assembly was told that the heavy losses sustained by the Board was due to subsidised power supply to domestic consumers for street lights and the Board and the TWAD free power supply to agriculture. The line loss is estimated at a high 18 per cent (against the national average of 21 per cent), the PLF of the Board was 58.3 per cent (against the national average of 52.8 per cent and NTPC's 90 per cent). TNEB reports a steep fall of power demand from a daily average of 60 MU to 49 MU because of the rains.

At the National level, the good south west monsoon has helped to bring about a normal situation, including in the perenially short supply areas of Karnataka, AP, Orissa and West Bengal. Some long term plans are reported in October. First, the country's first indigenously built gas based combined cycle power plant of 500 MW capacity by BHEL and supplied to Ahmedabad Electricity company is an important development for the increasing and massive use of gas based power plants. Second, the first stage in the revamping of power transmission net work in Calcutta by the Calcutta Electric Supply Corporation is being completed in 1992-93. This will help in the even distribution of the power shortfall between different users and segments, and can be used by all Boards and states facing a shortfall. Third, the National Thermal Power Corporation, referred to earlier, plans to spend Rs.28,600 crores in the revised VIII Plan (1992-97) to add 9881 MW in generating capacity. About half of this will come from existing projects, and the other half from new projects. Finally some issues in regard to our power planning have been raised. Projects under bilateral arrangements face two major limitations; they are costly and they cannot be fitted into the pattern of the local load demand. The addition of thermal plants should be given a lower priority against hydel and gas based power projects which have more producing capacity. Power planning should be done on a regional basis to make power generation optimal and power tariffs should be pooled to achieve economical power flow from within and outside the region. The Seventh Plan power performance was poor having attained an energy growth of

6 per cent against the planned 10 per cent. For the Eighth Plan, these lessons need to take into account, particularly in recalculating the power target which should be based on actual industrial/ agricultural use. The government announced that at the end of October, the second NAPP unit in UP attained criticality.

Urban Development

Three important development in the area of urban development in October may be noted. First in order to promote decongestion of the city, suburban areas are being developed. The first such area is Tiruvallur which is to be developed as a model, the MMDA being responsible for the grid development. This development of peripheral area would be a means of meeting the requirement of one million houses in the next 5 years. Second, the government is taking up the role of a facilitator in the field of housing, using about half of the Rs.630 crores from World Bank aided Tamil Nadu urban development project, not to build houses which the private sector and individuals would undertake but to provide the needed infrastructure - roads, bridges and slums improvement. Third, on the basis of this experience a guided urban development policy for the state is being drawn up, under which the state will not build houses but provide the basic services to develop the area, offering incentives to attract developments. Finally a density packed area development is being envisaged once the Telugu Ganga Project is complete and low cost housing technology spread. The building regulations needs to be revised to meet current needs.

Transport

In the field of transport, two developments in relation to road transport, and one in regard to sea transport need to be noted. As indicated in the last issue in the analysis of the state budget for 1991-92, the rise in bus fares from October 16 which was aimed at raising Rs.70 crores to make up for the projected loss of Rs.70 crores for the current year has given rise to wide spread agitation and protest against it - from political parties including those which are allied to the government, students and bus. October recorded an increasing number of strikes, dharnas and some violence in this issue. On October 26 the government announced reductions in the fare increases from November I, for city travellers, for long distance ones and students. This will cost the government Rs.I0 crores this year and Rs.25 crores in a full year. Second, the first state wide survey by the Institute of Road Transport presents an alarming scenario about drivers as the main road users: a)two thirds of the drivers are ignorant of road safety rules: two thirds of 4000 drivers interviewed did not know that mandatory traffic sign were given in circular design; five --- could not recognise a continuing sign (triangle) or an informatory sign (rectangle); over half that the traffic sign that permitted vehicle of more than a prescribed height thought it referred to the width of the road, only 8 per cent correctly assessed the distance that the vehicle will stop after brakes are applied: b) pedestrian crossings have become death traps, the annual number of pedestrian deaths being 2000: c) professional drivers are indifferent to other

road users and pedestrians in turn were ignorant of basic safety precautions. Some of the survey findings such as encroachment on pavements, poor quality of pavement surface, its not being continuous seem by the drivers but pedestrians are oblivious to them. There is need for a mass education covering both drivers and pedestrians in the cities. In the area of sea transport a second coal jetty which is urgently needed, is being constructed in Tuticorin Port this year at a cost of Rs.9 crores.

Population Project

The World Bank aided India Population project in being expanded from Madras Corporation and its 4 municipalties and 4 townships to 2 more corporations- Coimbatore and Madurai and 6 municipalities with the savings from the project of Rs.37 crores out of the Rs.69.13 crores alloted to it. The Government of India and World Bank have consented to their extension.

Supplementary Estimates

The government presented to the Assembly the final supplementary estimates for 1991-92, totalling Rs.31.58 crores. The estimates included the cost of 400 women police, upgrading 9 new police stations, purchase of modern fire fighting equipment from Japan, poverty programme extension, old age provisions and modernisation of cooperative spinning mills. What is not made clear, and should in future such estimates, is whether these will be set off by economics in the sanctioned budget or whether this will add to the budget deficit. The government announced one more DA to its staff from July 1 at a cost of Rs.85.44 crores this year and Rs.128.18 crores in a full year.

National

Plan

In October, the cabinet approved the Approach Paper to the VIII Plan. Its outline is familiar, as reported in the last issue - aiming during 1992-1997 at a growth rate of 5.6 per cent, an overall outlay of Rs.7,92,000 crores which was formally announced on October 26, with thrust on alleviation of poverty, population control, employment generation and provision of minimum needs. The public sector investment is projected at Rs.3,42,000 crores, an average rate of domestic savings of 21.6 per cent of GDP, a current account deficit (foreign savings). of Rs.49,000 crores (1.4 per cent of GDP), incremental capital - output ratio of 4.1, of gross investment of Rs.7,92,000 crores, investment by private corporate sector is estimated at Rs.1,48,000 crores and the household sector at Rs.3,02,000 crores, a 13.6 per cent growth rate in exports. The paper states that it opts for a conservative growth target which is already achieved in the VII Plan, keeping in line with the structural adjustments in the economy through the liberalisation measures and its negative impact at the start but with the reform yielding an improved ICOR in the next 2-3 year, which may make possible a higher growth rate than the target. The priority sector for the VIII Plan are 1)energy, transport and communication in the area of economic development, ii)employment generation, population control, literacy, health and rural

development in the area of human development and iii)irrigation, export promotion of agricultural production, and diversification of agriculture, in the area of agricultural development. The Planning Commission has in a paper set forth the need for a drastic change of the current style of planning and procedures, as a means of tackling the imbalance in the overall economic management - a kind of counterpart to the governments' reform policy involving: a) weeding out of the plan schemes and projects which do not have economic sense: b)rationalising plan expenditure by a process of consolidation of currently scattered schemes: and c) ensuring that sections which demand increased plan outlays generate net additional resources to the extent possible through non inflationary methods, and those who because of government policies have surpluses in excess of their approved outlays divert them to those who need higher outlays but cannot raise financial resources from within. The present plan scenario is clogged with schemes taken up from time to time, most being admitted not on merit but because of group pressure. While both union and state plans show delayed projects and critical imbalances in financial terms, there are growing deficit in the union and shortfall in states' plan expenditure. However even these inadequate outlays are unspent, so that ministers, states and even Planning Commission plead for higher plan provision in the union budget. This procedure needs reorientation, with emphasis on the critical VIII Plan goals of infrastructure, social sector and poverty alleviation through increase in employment and satisfactory minimum needs of the poor. These macro economic statements are unexceptionable, the test will be when they are translated into micro projects and above all when the first unneeded scheme or project will be weeded out. While supporting a higher role for the private sector, the paper states that this should not be at the cost of the "minimum core investment in the public sector". But with the experience of government sector dissaving, the levels of public sector outlay currently cannot accomodate the reasonable requirements of the crucial sector and so it says an innovative approach is needed which will generate enough resources in the public sector to both finance current outlays and generate additional resources to the support of the critical goals of the public sector plans. Once more the language and advise is unexceptional, but what is the innovative approach which can wipe out the present dissavings and produce more savings. Some of the practical proposals to carry out the above worthy sentiments are a little more practical such as: a)each ministries proposals should show both schemes discontinued and resulting savings: b)after the VIII Plan is formulated, no new scheme will be processed by any ministry and on rare occasion only as part of the Annual Plan: c)no ad hoc presentation of the projects to the committee of secretaries to be permitted: d)annual provisions to the budget will not be enhanced ad hoc: e)the rural development ministry programme should be changed as integrated local area development programme incorporating a number of scattered projects: f)department of energy should review programmes of each Electricity Boards before April 1992 and lay down targets for each Board's improvement of PLF, reduction of transmission and distribution losses:

g)profit making public sector projects will give part of their profits to government as dividends. It remains to be seen how and in what precise ways these practical guidelines are carried out in the VIII Plan.

Prices, Inflation and credit policy

The rate of inflation for September was a rise of 0.15 per cent on a point to point basis, the whole sale index standing at 208.6 per cent on September 28. On an annual basis, the index recorded the first fall in over a year from 15.3 per cent at August 31 to 15.12 on September 28. The slowing of the monthly inflation rate and the fall in the annual rate recorded in September is in the short run due to the decline in the prices of food articles, notably jowar, barley, tea, fruits and vegetables. The government release of more wheat and rice through the PDS will check their further rise in prices. From January 1, PDS is being revamped to cover the poorest of the poor in 1693 development blocks through out the country. This inflation decline as from October was predicted by the Finance Minister. This trend will be strengthened by the busy seasons (October to March) credit policy announced by RBI under which was hiked the bank rate, all lending rates and savings deposit rates. It has i)raised the bank rate, from 11 per cent to 12 per cent (for the second time this year, as in July the rate was raised from 10 to 11 per cent, ii) raised lending rates across the Board by 1.5 per cent, so that lending rates for both term loans and working capital will range from II.5 per cent to 20 per cent as against 10 per cent to 18.5 per cent, iii) discontinued refinance except for export credit and iv) has established a freeze on loans for consumer durables, shares and real estate at levels, obtaining on October 9. There is no doubt that this policy will dampen inflation by containing credit expansion by making credit more expensive, though the incremental bank credit for the first half of the year has been a mere Rs.97 crores and less costly and free credit is available to the corporate sector from mutual funds and finance companies as well as from the underground economy none of which is under RBI control. But the key to the success of the RBI clear money policy and deflation is the extent to which it can curtail net RBI credit to government, which is expected to fall in the second half of 1991-92, which will also reduce the usual trend of accelerated deposit growth during the busy season. The other object of the credit policy is to encourage exports by hiking the interest rates for preshipment and post-shipment credit. This is to be expected because with the trade policy, exchange rate policy and fiscal policy reformulated to encourage exports, monetary and credit policy have to follow in line with this national priority. There are problems. Banks will in the medium term find their asset portfolio falling, as the corporate sector may turn to non banking sources for their credit as earlier pointed out. Further the aggressive campaign for funds by the foreign banks for preemptive business will still reduce further the banks' resources. Second, one of the crucial elements for the success of the RBI's credit policy is the extent to which RBI can prevent credit from the RBI and other banks to government surging. Net incremental RBI credit to government was a high Rs.I0,279 crores

upto August 30. Can this danger be controlled and not only the net credit to the corporate sector which will merely cut back on production.

Stock Exchange, Tax Performance and Union loans

On the stock exchange front, in October, the major stock exchanges in New York, London, Geneva and Singapore are of the view that the existing stock exchanges in India can be integrated to establish a National Stock Exchange which could provide equal opportunities to all investors in the country to trade in any listed security and that there is no need to set up a New National Stock Exchange, as reported in the last issue. With this world view, the committee proposal for a new stock exchange will be on hold for some time. The real lack is the absence of machinery to discipline companies in matters concerning investors' grievances. Here there is a ready machinery, SEBI which should be empowered to handle the problem. The government, however, is of the view that investors' grievances should be handled by the Company Law Board because investors protection is not only on matters concerning debentures interest payment, but many other matters which SEBI cannot handle. But the issue of investors protection is becoming important and urgent, with the rash of public issues coming out, some of which relate to weak companies which are hidden by the blaring advertisements which never mention the danger and risks involved in the investment. In October major stock exchanges are facing an acute shortage of funds which is leading to a sharp increase in badla charges. In the early October the rates ranged from 40 to 48 per cent in the Bombay and Calcutta exchanges leading to a fall in share prices, which could make the badla rates to continue to rise. Already the 300 share Bombay Stock Exchange Index has fallen by about 100 points and to prevent its further decline, the funds in the market need to be increased and the control over the market made robust. Against this short term crisis problem, the general view is that the stock exchange and capital markets of the country will emerge stronger with the participation of the Mutual Funds, SEBI and the establishment of the Over the Counter Exchange (OCE), and the regulatory bodies are helping to build further the confidence in the market. On the tax front, the government states that it is planning to integrate laws relating to income tax, wealth tax and gift tax under a single National Code for Direct Taxes. While this is being done, the various proposals for tax reform made by its own (Rajah Chelliah) committee and the World Bank need to be taken into account, so that there is not only consolidation but also reform in the tax system. While the Rajah Chelliah committee is still at work on its analysis and recommendation for tax reference, the World Bank has suggested a) a substantial shift from customs tariff to domestic taxes to facilitate a reduction in tariff rates which is one of its major principles of structural adjustment for the country: b) the excise rate should be made much more uniform with higher rate for certain luxury goods and the introduction of the system of value added taxation: c)personal income tax should strengthen and the exemption limit kept constant to widen the tax now: d) tax concessions and

reduction should be rationalised, limiting them to long term investments. The philosophy behind these suggestions is a sound one, and that is taxation should not be increased to meet a worsening fiscal situation, which should rather be met by decreased government expenditure. On the Union loans, the government announced in mid October the issue of 4 loans for Rs.1200 crores. With this, net receipt from market borrowings this year will be Rs.3782 crores which is about half of the year's budgeted public borrowing of Rs.7500 crores.

Economy

There were several developments in the economy in October. First, the World Bank's assessment of the economy presented to the Aid India Consortium, which differs from that of RBI and the government states: I)the likely growth rate of the Indian economy in 1991-92 will be 2 to 3 per cent against the RBI forecast of 4 per cent, with the medium growth rate projected at 4 per cent as for the VII Plan against the government, the Planning Commission and RBI data of 5.6 per cent which has been incorporated in the Approach Paper: 2)the current account deficit is estimated at $9.93 billion for 1990-91, against the RBI estimates of $7.3 billion. (This is serious as it is a difference of 1 per cent of GDP, and seem to be more than a definitional difference): c)on this basis it recommends a further cut in government expenditure and a rise in taxes so that the fiscal deficit can be reduced to 3-4 per cent: d)the present crisis is traced to 1980 policies, with the Gulf crisis only precipitating matters and not causing it. The sober assessment is needed for our policy guidance. Second, the government announced in late October that the ceiling on the equity holding by non residual Indian and overseas corporate bodies is raised from 5 per cent to 24 per cent. This means acquiring 24 per cent through stock exchanges under the portfolio investment scheme, which is in accordance with the new policy to attract foreign funds. Third, the combined fiscal transactions of 25 state governments during 1991-92 are expected to show an overall deficit of Rs.2163.5 crores to be reduced to Rs.1459.2 crores through ARM by the states. The other feature of the states fiscal scenario is that in 1991-92 they will spend less on development and more on non development activities, particularly administration, interest, servicing of debts and pensions. Fourth, a series of monetary developments in October need to be noted: a)the foreign branches of public sector banks are estimated to have accumulated $1.6 billion to $1.7 billion of sticky credit of which atleast $1billion look like bad debts. They have already provided 600 million for bad loans and will need also another $400 million:b)the government launched on October 1 five scheme to tackle the problem of black money. Among the scheme is the issue of Indian Development Bonds denominated into the US dollars by SBI from October 1 to November 30. The second is remittances in foreign exchange to any one in India which will be immunity from direct tax laws. In this connection on October 25 the government and RBI eased the remittance norm in the immunity scheme. Further any one coming into India can bring up to $50,000 and use it freely without producing of the passport, or the source of the funds.

Third, persons can make a deposit with the National Housing Board by November 30 and no questions will be asked about the source of funds. And fourth the black money holders are being given much more opportunities upto 31 March 1992 to declare their undisclosed income. Fifth, the procedure for such declaration is simplified. The government reports that in the first week of this amnesty scheme, it has attracted Rs.800 crores. The Indian Development Bonds thus attracted $400 million, under the second scheme of foreign remittances India, it has attracted a further Rs.1000 crores. These early successes has suggested to the government the possibility of extending the date of the schemes beyond November 30. The government has warned all banks against black bonds which have begun circulating. In response to pleas by NRIs in the UK, RBI has launched on October 24 sterling bonds which carry an interest of 13.25 per cent. A fifth development is the implementation of the decision of the conference of Chief Ministers to complete the distribution of surplus land under land ceiling laws by March 31, which will help SCs and STs. Sixth, the RBI reports that the scheme to set up a National Cooperative Bank of India has run into difficulty, particularly in its relation with NABARD. Finally the sugar industry, in all 3 sectors, cooperative, private and public sector has incurred a loss of over Rs.700 crores. It is estimated that fertiliser imports will cost Rs.7000 crores in 1992-93.

Industry

The CSO index of industrial growth in June 1991 shows a decline by 1.9 per cent compared to June 1990 and for the 3 months April-June the fall is 1 per cent (from 200.7 to 198.7). For July the CSO index shows 10.6 per cent. During April-June 1990 the index of industrial growth showed a rise of 12.6 per cent. The major decline continues to be in manufacturing, in April it declined by 1.4 per cent, in May by 4 per cent and in June by 1.7 per cent. For April-June 1991 manufacture declined at 2.4 per cent compared to a rise of 14.6 per cent in 1990. In mining the index rose marginally by 0.1 per cent compared to last year's 4.7 per cent and in electricity the rise in April-June 1991 was 6 per cent compared to a rise of 9.8 per cent in April-June 1991. This confirms the forecast that the 1991-92 industrial growth record will be poor, possibly negative, which the tight credit and monthly policies may further strengthen. CEI reports that the engineering industry has registered a large negative growth rate of -8.8 per cent for April and May 1991, compared to the rise of 13.4 per cent in 1990-91. This will be a major contribuant to the negative growth of manufacturing. The revival of sick units might be a major condition for funding by financial institutions and banks of new projects and expansion of industrial groups. The government has asked banks and FIs to be cautious about providing funds to promoters with weak units. On the other hand, the government is said to be working on the exit policy for industry in which there may be tough conditionalities on entrepreneurs who have made their enterprises sick and wish to close them. For their revival on the basis of a BIFR package, the policy will insist on the entrepreneurs bearing a major part of financial burden. The exit policy under

preparation will ensure that that the units are not shut down in order to invest in more lucratic fields as happens now, as pointed out by BIFR. As part of liberalisation and reform package, at the end of October, the government announced a revised policy and procedure for investments by NRIs and overseas corporate bodies (OCB's): i)they can invest up to 100 per cent foreign equity in any industry, including small industries, except in industries reserved for the public sector with full repatriation rights: ii)100 per cent foreign equity is also permitted in hotels, tourism related industry, hospitals, shipping, export oriented deep sea fishing and oil exploration services: iii)the foreign eq- uity should cover the need for import of capital goods: iv) the proposed NRI and OCB's project must not be located within 25 km of an urban area : v) existing schemes of l00 per cent NRI investments in 100 per cent EOU units as also the scheme for the rural sick units to continue: vi)no indigenous clearance required for these schemes including import of capital goods fully financed by NRIs: vii)for licensing the existing 40 per cent and 70 per cent NRI investment schemes to be discontinued. It is expected that this decision will lead to increased flow of NRI funds. Another decision as part of the liberalised policy is to permit the private sector with an outlay of upto Rs.25 crores to enter the power sector, without any techno - economic clearance by the Central Electricity Authority. The power projects are also open to foreign investors who are allowed to invest 100 per cent equity. Also at the end of October the government announced guidelines on trading in exim scrips with a view to provide a)greater stability and transparency and b)remove the anamoly between phased manufacturing programme units (PMP) and the ones which had completed their PMP provisions. This means demand and supply forces (the market) will determine trading in the scrips in which in addition to importers, exporters, dealers and existing inter measures, FIs, banks, stock exchanges and Over The Counter Exchange of India (OTCEI) will disseminate information and trading in Exim scrips.

National Production Front

Steel

SAIL reports that in the first two quarters of the year, April-September records a positive trend. Its five plants, Bhilai, Durgapur, Rourkela, Bokaro and Burnpur (IISCO) have produced 0.538 million tonnes of steel in the current year compared to that from last year. This is part of the plan to increase SAIL output by 1 million tonnes in 1991-92. They have produced 9.29 lakh tonnes of hot metal, 8.14 lakh tonnes of crude steel, and 6.55 lakh tonnes of saleable steel during the last month, September 1991. Its deliveries have correspondingly increased. SAIL also reports an increase by 32 per cent in export of steel products during these 6 months and in terms of value the increase has been 72.5 per cent. Its exports are both diversified and increasingly value added.

Crude

The country will import in 1991-92.19.6 million tonnes of crude and 10 million tonnes of products at a cost of Rs.l2,500 crores compared to last year's import of 19

million tonnes of crude and 8 million tonnes of products costing Rs. 10,000 crores. Faced with a widening gap between the projected demand and supply of petroleum products, the government has decided to add about 8.20 million tonnes per annum of refinery capacity through expansion and debottlenecking of existing plants at a cost of Rs.1300 crores. This is to be done in seven refineries: another 6 million tonnes is needed for which plans have been established and clearance from the ministry of energy awaited.

Coal

The target for coal production has been fixed at 310 million tonnes for 1994-95, against the production of 212 million tonnes in 1990-91. This will cost Rs.20,400 crores which can be justified at some rationalisation of price and giving up of the present policy of artificially ruining of coal prices. Coal mines are losing heavily, even after allowing for improved efficiency and OMH. The government reports on the one hand that on October 1, the cash and carry scheme under which all union and state power plants will pay the Coal India in advance was launched and that on October 4 all curbs on coal movements have been lifted as all the State Electricity Boards have agreed to pay in advance for coal supplies. This is good both for the state boards and CIL. Also CIL states that it will introduce a new marketing policy from January 1992 which is to ensure direct contact between the coal companies and the final consumers, with no middlemen. This will call for complete restructuring of the marketing set up of CIL. One important decision by the Union government is to cut all budgetary support for CIL from 1992-93. Whether this sudden cut from this year's Rs.200 crores subsidy to zero next year will work without disrupting CIL remains to be seen. One piece of good news which counter-balances the many problems faced by the coal mines in Bihar of depleting coal stocks, and irregular power supply besides the coal mafia, is the report of the Central Geological Programme Board of the Identification of 864.78 million tonnes of coal reserves including of 257.03 million tonnes of proven grade in the North Eastern coal fields.

Non Ferrous

The aluminium industry is reported to be experiencing a glut with major indigenous producer reporting mainly inventories of over 40,000 tonnes. NALCO reports that its expansion work will start in March 1992 and be completed by 1994-96. The estimate for the expansion is Rs.2801.4 crores involving doubling bauxite production from 2.4 million tonnes to 4.8 million tonnes and aluminia from 8 lakhs tonnes to 13.5 lakh tonnes and smelter capacity from 2.18 to 3.45 lakh tonnes. Hindustan Zinc reports signing a memorandum of understanding with the government under which its sales turn over will increase in 1991-92 to Rs.640 crores from Rs.436.77 crores, which is an increase of 47 per cent, and assumes that it will open and operate mines and smelter competitively and will maximise the internal generation of resources, providing for a minimum of 10 per cent post tax return for the year.

Agricultural Production

The 4 month south west monsoon which has just ended can be described as satisfactory as the Indian Meteorological Departments (IMD) does, or as unsatisfactory, as the North West states do. It is a case of a glass being described as half full or half empty. 28 out of 35 meteorological divisions had normal or excessive rainfall accordingly to IMD. But the rainfall was deficient in HP, the hills in Western UP, Haryana, Rajasthan and Saurashtra and Kutch. The result is that khaxi target of 103 million tonnes may not be attained, the estimated shortage being by placed at 8 million tonnes. To make up for this deficiency, the rabi target has been raised from 79.5 million tonnes to 83.7 million tonnes. With subdued rainfall in the last month of the monsoon, September, and the questions about the adequacy of sub soil moisture, the revised rabi target is felt by some states to be on the high side. As of now it looks as if the overall foodgrains target of 180 million tonnes for 1991-92 will be difficult of attainment. The government in the Ministry of Water Resources announces that it will bring an additional 2.3 million hectares under the irrigation during rabi. There will be a 11 per cent increase of 21.2 million hectares irrigated during rabi 1990-91. Against this background the World Bank advice to reduce the buffer stock from the current 19 million tonnes to 10-11 million tonnes might cause some anxiety but it is also the advise of some of our own expert committee. If this level of 10 million tonnes is accepted with an investment fund of $150 million to import food if necessary, there will be adequate safety. In any case as both the World Bank and our own expert committee has said, there is need to improve our management system, review Food Corporation's role and trim the public distribution system.

Foreign Trade and BOP

DGCI reports that during April-August India's exports declined by 7.8 per cent in dollar terms (in August it fell sharply by 10.7 per cent). Imports shows a sharper fall than exports a 15.3 per cent - $7619 million (in August the decline is 20.4 per cent).The trade deficit during the period was Rs.2253 crores (which was a decline of 38.3 per cent) against the higher Rs.3141 crores in April-August 1990-91 (in terms of dollars it was $1002 million). In Rupee terms,exporters recorded a growth of more than 20 per cent, Rs.12374 crores over the same period last year. That was one effect of the 20 per cent depreciation of the Rupee. The government announced that following a review the duty draw back rates have been increased for export (thrust) products like engineering, electronics, chemicals, paints and pigment and textiles. This falling exports and widening BOP gap is serious for these reasons. First, it endangers the whole macro economic adjustment programme which rests on surging exports. Second, export from India is declining not because of high labour cost, not because of lack of technology not because of unreal exchange rates, not because its imports are increasing. The reason is the poor quality of our exports. The IMF has asked international commercial banks to support India in its commercial borrowings operations to help finance its BOP and foreign trade. In this connection the serious difference between the estimate on current

account deficit between the World Bank and RBI was earlier referred to - the World Bank estimates India's current account deficit in 1990-91 at $9.93 million which is 3.5 per cent of GDP, while RBI's estimate is $7.3 million (2.5 per cent of GDP). In view of India's international commercial transactions, this discrepancy should be quickly resolved. One set back in our foreign trade negotiations is that India has not been able to settle major issues between it and the US during the visit in October of the US trade representative. The problem areas are: a)the US demand for India to follow the Mexican example on intellectual property rights (IPR) under threat of trade retaliation under special 301: b)in addition to inviting foreign private investment with majority equity participation, it is demanded that dividend remittances should not be covered by tax free export earnings: c) in addition to India's offer to increase the period of process patent and royalty there on, India's export of bulk drugs which just about cover their import need to be cut: d) while India is required to increasse access to services from US and abroad, India's professionals and construction personnel are not given free entry into their countries to enable them to compete for job vacancies. Thus there is at present no fair deal or quid pro quo on IPR and trade negotiations with the US. On individual items, the oil import bill, on the basis of the Rs.3124.60 crores from the period April-August looks like totalling Rs.12000 crores for the year and not the anticipated Rs.15000 crores. To further promote the export Basmati rice which has now become internationally competitive, the government has simplified its export procedures, removing the requirement for separate licenses, using just the registration and allocated procedures. On this basis, 200,000 tonnes were exported in October. On jute exports, the government forecasts, jute product exports crossing Rs.1000 crores shortly, with the diversification into decorative textiles, furnishing fabrics and jelte reinforced plastics. Again engineering exports according to the Engineering Export Promotion Council will exceed the revised target of Rs.5000 crores for the year, on the basis of the 38 per cent income during April-August 1991. Exports of leather garments are set to reach a record of Rs.900 crores this year compared to less than Rs.600 crores in 1990-91. The export front is looking up.

Aid and loans

The government and IMF are negotiating in October successfully to convert the $2.2 million standby credit from IMF into a medium term arrangement under the extended fund facility (EFF) of the Fund. The first tranche of the $2.2 billion will be $800 million in early November. This EFF credit is important as the country is in a debt trap in respect of its short term borrowings, which is being met either by rolling over repayments or taking fresh loans to settle earlier loans. The long term debt burden in rupee terms has gone up by 21 to 23 per cent as a result of the July 1 and 3 devaluation. Servicing the debt, that is repayment of principal and interest in 1990-91 was Rs.9,614 crores which is 30 per cent of the export earnings. The country's foreign balances have risen from Rs.2616.78 crores, September 6 to Rs.3043.56 crores on September 13 and Rs.3974.02 crores on September 20, after paying of the gold loan (of $88 million) from the Bank of

England and Central Bank of Japan, mainly because of the $635 million from IMF, and stood at Rs.5300 crores on October 11. The World Bank and Consortium loans will swell the reserve. The World Bank/IDA has made a loan of Rs.104 crores for the West Bengal afforestation project. It has also sanctioned $156 million for environmental projects for the first time for the control of pollution caused by chemical industries in Gujarat, Maharashtra, Tamil Nadu and UP. It has also further approved $153 million for dam safety projects, ensuring the flood handling capacity of 940 crores large dams in 4 states. All the IBRD and IDA loans and credit should be speedily used and not allowed to accumulate as in the recent past. IFC announced an investment of $1.58 million to help establish the $10.5 million Indus Venture Capital Fund.

International

IMF-World Bank Annual Meeting

The Fund-Bank meeting was held in Bangkok this year in October 16-19. It was preceded as usual by a meeting of the developing countries (G-24) which this year emphasised the need for easy and successful conclusion of the Uruguay round in response to the increasing number of developing countries undertaking macro economic adjustment programmes and structural reforms which face a deteriorating external environment, seen in the use of non tariff barriers by industrial countries and the lack of genuinely multilateral trading system which face distortion and structural rigidities in industrial countries. Further, scarcity of capital and lower savings of the industrial countries due to increasing budgetary difficulties and the net negative transfers from the Bank from borrowing countries - all need immediate attention. The interim committee of IMF ended its 2 day meeting endorsing the call to comercial banks to provide support to countries engaged in strong economic reform programmes and which are servicing their debt despite very difficult external circumstances. It called upon all parities to work expeditiously towards a normalisation of financial relations in these cases when the restructuring of bank debt was a necessary complement of strong adjustment efforts. It called on the Paris club to continue its discussions on how to implement promptly additional debt relief measures on a case by case basis. The World Bank at the Bangkok meeting underlined the importance of the private sector in economic development and setforth a 5 point programme to achieve the Bank objective of reducing poverty. Scarce domestic and external resources should be used effectively to accelerate development, stimulate employment and reduce poverty. For this, the World Bank 1) must serve as a strong leader of the global demand effort by articulating the interest of the developing countries, 2)must support policy reform at both macro economic and sectoral levels, 3) must help to ensure that growth is equitable to serve the poor, 4)must mobilise funds in the capital market and stay strong and 5)must improve and accelerate services to the borrowers. At Bangkok, IMF classified USSR and the Eastern Europe countries as "developing countries" because of their economic problems. Its report says "two new member countries of Eastern Europe,

Bulgaria and Czechoslovakia and the USSR were added to the group of developing countries." The Bangkok mee ting made no breakthrough on the question of additional SDRs which the development of devêloping countries urgently need and have been pleading for.

World Economy

IMF in its world economic outlook forecasts a 5 per cent growth for Asia in 1992 and a significant fall in inflation. This means that a relatively moderate rebound in the world economy in 1992, with output rising by 2.75 per cent. The strategy of economic reforms was beginning to pay, particularly in Latin American countries. The Fund and Bank are engaged in tackling poverty through promoting growth. The developing economies of Asia, particularly Thailand and Indonesia have entered a period of heating in the first half of 1991. Inflation and real wages increased and labour shortages and infrastructure bottlenecks became pronounced. Economic activity in the western hemisphere will be sluggish in 1991, with a small rise in GDP after the decline in the previous year of 1 per cent. Average inflation for the region will remain substantial and the combined current account deficit will widen by $12 billion to $18 billion. Output in developing countries will fall by half to one percentage point in 1991 mainly due to the decline in economic activity in E.Europe and USSR. This decline is due to the fall in regional trade among them and the adjustments following from the transition from the centrally planned to a market economy. The slow down in the expansion of the world economy and increasing stock of agricultural commodities contributed to a fall of 8 per cent in 1991 in nonfuel commodity groups. The slow down in economic activity in 1991 in North America and the UK will contribute to a fall in imports and a reduction of external deficits in these countries. The output of the developing countries will decline by half to one per cent this year. The Asian region will register the highest growth at 7 per cent this year. The report advises developing countries to shift the composition of their public spending programmes towards investment in physical infrastructures and away from less productive uses like subsidies and military spending. It warns that there is little prospect of an increase in the flow of external savings to developing countries or a rise of domestic savings rates unless there is improvement in macro economic and structural policies and less direct controls. It says that an open payments system and adherence to appropriate exchange rate policies are essential to attract inflows of external savings and the return of flight capital. It says it is essential for governments to win private sector confidence and build up credibility through persisting with policy reforms. A number of developing countries like India, Pakistan and Bangladesh are now welcoming foreign direct investment. The total external debt of developing countries reached $1.464 billion in 1990 end and will be $1.530 billion at 1992 end. UNCTAD in its report on the 1990s has warned that a large number of developing countries are locked in a vicious circle of over indebtedness, under investment, increasing macro economic instability and inadequate external support on which the earlier IMF report provides detailed data. It has warned that breaking out of this

vicious circle and moving on to a path of sustained growth is urgent and presents a challenge. The developing countries continue to face a policy overload unless they are given assistance that is both timely and on a state commensurate with their problems. The UN reports to the Bangkok meeting states that Asia's economic boom over the past 3 decades has failed to curb widespread poverty and the number living on the margin of survival is growing. A broad range of long standing social issues are unresolved in the Asia-Pacific region and rapid economic growth to which earlier reference was made in the IMF report has generated many new ones - particularly the widening scourge of poverty.

Uruguay Round

While the Director General of GATT is optimistic about the successful conclusion of the Uruguay now before the year end the developing countries, including India are faced with a take it or leave it text. This means that they are going to have to accept a series of high cost options without any corresponding gains. The text now being prepared will be tabled by the end of October, giving countries only two options - either accepting the proposals or opting out of the Uruguay round - both disastrous. Objection to the arbitrary mode of concluding the round by India, Pakistan, Brazil, Mexico and Egypt have been summarily dismissed by the industrial countries, with the European Community taking the lead.

Common Wealth Summit

The declaration of the commonwealth summit at Harrare on October 20 calls for a)the promotion of democracy, human rights and the rule of law as top priority for 1993 and has condemned the emergence of ethnic, chauvinist, racial biogotry and other forms of biogotry as a threat to peace: 2)all nuclear testing should be halted and curbs imposed on conventional weapons build up: 3)increased aid for development to the developing commonwealth countries which led by India successfully defeated the attempt of the heads of UK, and Canada to link aid with democractic reforms and human rights. The declaration is a set of empty platitudes as no one objects to the spread of democracy or human rights: what is needed is a time commitment to reduce debt and increase aid. This is not forth coming.

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II. Agricultural Development In Tamil Nadu

Paddy and other crops

The continuing rains in October have buoyed the state's farmers, who are engaged in both the kharif and the samba crops. The widespread and continuing rains have raised Mettur storage to 52.235 mcft (the full storage being 93,430 mcft) on October 28 and so the discharge has been reduced. Farmers are working on 9.53 lakh hectares compared to last year's 8.73 lakh hectares. In Thanjavur district alone, the farmers are cultivating 4 lakh hectares.

As a result of the wide spread rains, the Vaigai reservoir level reached 43.3 ft (full level 71 ft), and that of Periyar 113.3 ft (full level 152 ft). The Kanyakumari district paddy farmers are using the heavy showers of the last week of October, to expand the area under paddy and if the same is done by the farmers in Chengai Anna, Salem, Periyar and Coimbatore districts and if the North Arcot paddy farmers who are dependent on lift irrigation for their paddy crop - both samba and subsequent Navarai - receive as they expect adequate North East monsoon rains, they will use both lift irrigation and the surface flows of the Palar and South Pannar rivers for their cultivation. As of end October, the farmers in the state have brought 9.25 lakh hectares under millets (last year 8.62 lakh hectares), pulses 3.45 lakh hectares (last year 8.62 lakh hectares) cotton 98 lakh hectares (last year I.09 lakh hectares), sugar cane I.72 lakh hectares (last year I.77 lakh hectares) and oil seeds 2.85 lakh hectares (last year 7.2 lakh hectares). They look forward to the short term crop loans totally Rs.275 crores which will be extended to them through the 4655 primary agricultural cooperative banks and some Rs.56 crores as medium term loans to be used for purchase of fertilisers, instruments and HYV seeds etc. On this basis, rice output in the state is estimated to increase to 62.52 lakh tonnes against the 58.5I lakh tonnes that the state's farmers produced last year. The crop on which they are at work are pulses to produce 4.60 lakh tonnes, millets 17 lakh tonnes, oil seeds I4.50 lakh tonnes, sugar cane 24 lakh tonnes and oil seeds I4 lakh tonnes. All the various crops are doing well and are likely to bring an adequate income this year for even the small and medium farmers and those farming in the dry areas. The introduction of identity cards for fertilisers distribution at first annoyed the farmers because of the delay involved, and the higher open market prices they had to pay made them realise that their fertiliser requirements will be fully met.

Research results

In October reports on 38 research projects were received, and of these five groups of reports are of immediate interest to the farmer, as he can transfer to the field now the reported result. There are four reports on rice in the first group. The college of agriculture, Koraikal which reports developing a new rice variety KKL4 bringing together 1R20 and ADV 38. It is a semi dwarf variety, is tolerant to salinity and alkalinity which is of special interest to farmers facing those 2 problems and matures in a little over 4 months. A report from Ponneri states that farmers using IR-64 during kharif were able to harvest 9375 tonnes of paddy per hectare. Paddy farmers are advised to raise the nursery in May and begin planting in June. TNAU reports that direct sown semi dry rice in Thanjavur is now becoming popular and meets the districts water scarcity. The problem of weeds can be controlled by hand weeding and herbicides: similarly the increase in deficiency can be treated by soil application of ferrous sulphate. The fourth report from Aduthurai states that the cauvery delta farmers who face drainage problem are advised to use urea, DAP and gypsum as carrier materials for herbicide application. Second, three reports on groundnut are of particular interest to

Tindivanam groundnut farmers. One is the use of a high yielding HPS released by ICRISAT - called ICGV which is a heavy yielder. Second, is a report from Vridachalam on 4 non monetary inputs - timely sowing, optimum plant population, use of the TNAU improved seed planter, and irrigation management - which almost doubles the groundnut yield. Third, Pusa advises groundnut farmers that the TCGSI variety which is less susceptible to rust and leaf spot and VRI 3 which is resistant to collar rot, and TNAU 97 which is resistant to pests boost the yield. Third, five reports on various millets are of interest to the dry farmers in the state (one is TNAU's weed control for rain fed sorghum, a second in National Pulses Research Vemban's report of the 4 measures to control brown rust in cow peas, a third is from the Perumalpalli's research station on the sorghum based system for dry farming and fourth the Vemban report again on the means of checking the poddy fly in redgram and fifth the Kovilpatti research station report on the 4 means of identifying and controlling the destructive pest stem flies that infest pulses grown by the dry farmers. Fourth, there are a series reports on keeping the cotton pest at bay from TNAU, Trichy, the sowing of pregerminated seeds in bitter-gourd, from Palur vegetable research station, from Vemban base on growing hedge lucerne which is a protein rich legume, from TNAU, Udagamandalam on controlling the dreaded ring spot disease in cabbage through rotwater treatment of the seeds, from TNAU centre at Tiruchi on the 10 measures that the cotton farm can take to keep prudence and other pests at bay, from the CMFRI research Centre, Tuticorin on means of conserving the sea cucumber, from the Bellampai horticulture centre, on means of developing and growing crops on saline and alkaline soils, and the two reports on coffee, one from the horticulture centre, Thodiyankulam on foliar feeding of the crop and the other from the Pallur station on the control measures to be used to check the coffee berry borer. Finally to the sheep farmers, the Madras Veterinary college on the control measures to check blue tongue in sheep which can be immediately put to use, as well as Namakkal centre's advise to the cattle farmer on the various actions to be taken from prompt notification to the animal health centre and regulation of the grazing for ensuring nutritional efficiency and parasite contro

Sericulture

Mulberry cultivation and silk cocoon production are expanding in the non traditional area of Tiruchirapalli district. To meet the growing demand for silk domestically, the World Bank has aided a sericulture project which is now in the year out of the five year project life, which has quickened the pace of mulberry cultivation in the area which has traditionally specialised in rice, banana and sugar-cane but is now expanded over to sericulture. The World Bank's Rs.4l crores is covering Tiruchi district and 9 other districts. Mulberry farming till recently confined to Dharmapuri district has now become a state wide farmers' activity.

Plantation crops

The state and the country is doing well in the growing of plantation crops. A 19 member *scientific advisory committee* has been set up to promote and facilitate

concerted efforts in promoting and coordinating research and development in the plantation sector, export of agriculture and allied commodities and advise on the policies to be pursued in them. The committee's membership comprises the Vice Chancellor of the Agricultural universities, representation of UPASI and the different ministries. The committee will advise the commerce ministry on all aspects of research, science and technology in the plantation sector and will be an important instrument to push forward the new liberal trade policy with regard to the plantation products. With regard to : *Coffee*, Tamil Nadu produced 18,000 tonnes of coffee in 1990-91, the highest during the past 5 years. For the country, it has been decided by the Coffee Board and government that from the current year, 1.20 lakh tonnes of coffee would be exported annually in order to earn the valuable foreign exchange it will bring. For 1990-91 the coffee output is 2.10 lakh tonnes, upto August 1991 33,441 tonnes were exported and the coffee board has commitments to export 1 lakh tonnes. The Coffee Board has been urged by the government to concentrate on value added and speciality coffee to earn more foreign exchange within a given quantity of export. The Coffee Board announced that it is engaged in the task of producing speciality coffee under a brand name, of pushing cherry coffee, of segregating coffee according to plant strains and preparation of high altitude coffee. A representative of ICA stated to the Coffee Board conference that with the collapse of the International Coffee Agreement, and the future of the price stablization objective of ICA will lie more on the side of private market intervention such as futures, options, stock retention financing. He proposed that a corporation set up with private donations of a soft loan from the multilateral organisation can be vested with the mandate to stabilise the market without any fixed price range. In any case, the annual meeting of the International Coffee Organisation meeting in London at the end of September noted that the present system of quota less coffee trade will continue at last till September 30, 1992. Thus all efforts by the ICO to improve the system of quotas which has been criticised by both producers who feel that they are not receiving their shares of the quotas and consumers who complain that the quality of the quota coffee is poor and that non quota countries get coffee at cheaper rate, this attack from both sides led to the collapse of ICOs from July 1989. A search is now on for a more effective system and for this ICO has set up a working group to carry out a wide ranging review of all proposals on future international cooperation on coffee matters, ranging from the views of the African coffee produces that the quota system should be restored, to the Latin America producers view that a retention scheme should be operated to help stabilise prices. The group membership is open to all members and it should report to ICO before the last week of April 1992, on the basis of which the ICO council will negotiate on a new ICA and complete the negotiations by December 30, 1992 so that it can come into effect by September 30, 1993. In the meanwhile the ICO council has decided to extend ICA for another year from September 30, 1991 to September 30, 1992. This decision has to be accepted by alteast 20 exporting and 10 importing countries to come into effect. If that does not happen, ICA will have to

be liquidated, which is unlikely given the attendance and honour of the last meeting. On *tea*, Tamil Nadu produced a high 106 million kg in 1990-91 and expects to produce II0 million kg in 1991-92. While the international agreement in coffee has collapsed as noted above, resulting in both producer and consumer suffering, India as a relatively small producer of coffee does not have a great stake in it. But with regard to tea, India is the 5th major producer and till recently the most important exporter. Hence it is very important that both the national and international setting for tea production and its price and unit realisation should be carefully guarded and developed. On *rubber*, Tamil Nadu production was I,26,000 tonnes in 1990-91. The problem with rubber in the country is the widening demand/supply gap. The total area under rubber cultivation is 4.4 lakh hectares (predominantly by small growers with 400,000 units) and its production in 1988-89 was 2.75 lakh tonnes. With the increase in production of automobiles, the consumption of rubber is constantly increasing to 341,800 tonnes in 1989-90. While the demand for natural rubber has doubled in the 80s, production growth has been slower. The gap between supply and demand is filled by imports since 1935. The deficit now is between 12-19 per cent. The demand in 1994-95 is projected at 4.84 lakh tonnes and at 7.07 lakh tonnes by the turn of the century. Hence the Rubber Board successful programme of reducing the deficit from I8.2 per cent in 1987-88 to 17.4 per cent in 1988-89, to 13 per cent in 1989-90 and to 7 per cent in 1990-91 nearly through increase in productivity and the area. This needs to be pushed so that the gap is closed. The question of using synthetic rubber also needs to be explored. STC's record in importing rubber and distributing it has not been satisfactory and should be reviewed.

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III. Industrial Development of Tamil Nadu

The industrial development scenario in the state in October had the usual pluses and minuses.

On the positive side, *first* the revival of *Standard Motors* is now ready with BIFR: a)having worked out a Rs.34.36 crores rehabilitation scheme, b)decided on the discontinuation of the production of the cars by the company which was the main loss making factor, and as earlier issues of the Bulletin raised the question of its viability as it did not have the critical minimum demand to pave its way with no import content, c)also calls for a more fuel efficient engine for its light commercial vehicle (LCV), d)the funding to be the promoter to provide Rs.5.54 crores in equity, i) the financial institutions Rs.I5.69 crores and ii) the state government Rs.3 crore as loan, e)decided that Rs.I0.75 crore will be used for capital expenditure, Rs.I6.7I crore for meeting labour dues, and cost rationalisation of

labour and Rs.3.20 crores additional margin money for working capital and f)further decided to get labour's agreement to terminate 999 workers, payment of wages relating to the closure period in 2 or more instalments during 1992-93 and a wage freeze, and reinduction of workers in a phased manner in line with production plans. Thus at long last there is agreement on starting the factory and the next 2 months are to be used to agree on the modalities of the reopening. The promoters hope that the company can be restarted in early January 1992. *Second, Ashok Leyland* is being expanded by its joint owners Hindujas and IVECO. Hindujas are planning to use Ashok Leyland as a flag ship for all their future investments in India, IVECO will use it as its India manufacturing branch. The Hindujas plans include a lignite based power plants in the state, a bagasse based newsprint plant in the state and a tyre manufacturing unit in the state or AP. IVECO will use Ashok Leyland to launch a range of 6-9 tonnes trucks which are intermediate LCVs, with Ashok Leyland's mother plant at Ennore manufacturing Leyland engines, trucks and axles, the Hosur plant manufacturing low volume speciality vehicles and use its closed plants at Bhandara and Alwar. *Third, the Salem plant* to manufacture *High quality sintered magnesium (HQSM)* with a Rs.80 crore equity, of which the Common Wealth Development Corporation will provide an equity of Rs.12.58 crores, Tamil Nadu Magnesite will provide 26 per cent, Khaitan supernoy 25 per cent, and in addition there will be term loans of Rs.144 crores. The plant will start in March 1990 with a capacity of 30,000 tonnes of HQSM. *Fourth, Ankut Granites* the flame finished granite manufacturing plant at Hosur is about to be complete and will start up in February 1992 producing, being the first to manufacture flame finished granite hills in the country. *Fifth, the pilot rural housing project*, a joint Rs.22 lakh effort of the state government, HUDCO and Anna University School of Architecture and Planning is new ready. Each house costs Rs.6000 in the 4 villages in the plan and slightly more for serumalai houses. One problem faced by the project is the inadequacy of the loan for each house because of the steep cost escalation. *Sixth,* the Centre for Electro Chemical and Energy Research of the *SPIC Science Foundation* reports a break through in the development of process technology for fabrication of fuel electrodes which are used in solid polymer electrolyte fuelcole. *Seventh, the Tamil Nadu Energy Development Agency* (TEDA) in cooperation with the World Bank is starting a Rs.100 crore wind farm project in Nellai Kattaboman district. The project which produce 50MW is part of a 400 MW project. *Eighth,* at the *Perungudi industrial estate*, commercial production of statics the only load cells which is a critical component of electronic weightage systems has started. It is a joint Indo-US project. *Ninth,* the state government has taken the initiative in setting up *Acqua culture estates.* These are being set up within all the needed infrastructure - roads, tanks, storage places etc in a 200 hectare area. It has also decided to give 25 per cent of the capital as subsidy. The project will both provide rural employment in the prawn hatcheries being set up and promote export trade in prawns. *Tenth,* one of the most encouraging developments is that the present government has decided not to reverse the decision of the

previous government (see Vol XXI p286) for the government through TIDCO to disinvest in the Tamil Nadu's cement corporation *TANCER*. It has accordingly moved the high court to vacate the court's interim order staying the disinvestment. This is the policy set forth by both government for the state not to enter areas where the private sector is able and willing to do so, because of the states limited entrepreneurial facility. *Eleventh, IDBI* has reopened the *B&C* closure case and has revised upward its modernisation package by 33 per cent. It has in its report to the labour commissioner stated that the revised cost of revising B&C will be Rs.84.13 crores to be contributed by the financial institutions and the Bank. IDBI has also reiterated the need to shift B&C process house from Madras to Bhuvanagiri. Finally the plan for establishing the first Tamil Nadu's *gas turbine power* project at Vengidangal near Nagapattinam, using ONGC's Narimanam 57,000 cubic metre of gas to produce 600 lakh units of power annually is progressing well. The Chief Minister laid the foundation of the project on October 18. This could be one means of meeting the 4300 MW of power which is needed in the state to meet the anticipated shortage in the power sector.

On the negative side, *first* a state level review to evaluate the performance of Tamil Nadu banking system, it was found that though credit availability in the state is among the highest in the country - the *Credit Deposit Ratio(CDR)* of Tamil Nadu being 98 per cent in 1990-91, with total deposits at Rs.13,636 crores and total advances at Rs.13,290 crores - the actual credit flows to the various sectors, including the priority sector has fallen short of the norm, in that year - 1990-91. While banks had done well in the implementation of the special foodgrains production programme, oil seeds production programme and IRDP, the schemes which fell short of credit targets were: a)self employment scheme for educated unemployed (SEUY), b)self employment scheme for urban poor (SESUP), and c)self employment scheme for urban micro enterprises (SUME). The percentage of priority sector advance to total credit in the state had fallen to 38 per cent against the 40 per cent norm. This calls for the recycling funds so as to take the bank credit to a greater number of needy priority sector projects. *Second*, the NAPCO Aromatics projects is still hanging fire with the file on the project sitting in the minister's dick without any action despite repeated reminders by the state and union officials. One result is that the cost estimate is escalating and is now Rs.1730 crores. *Third*, the winding up of *MALCO* is dragging on. The Madras High Court on July 10 stayed the operation of the notice issued by BIFR to wind up the sick MALCO. This needs to be countered and BIFR on its sides has yet to file the counter writ to vacate the interim order of the court. BIFR should move on the case and end the agonising suspense of the workers, the management and the government as soon as possible. *Fourth*, as noted in the last issue the *handloom industry* in the state has taken strong exception to the state government's recent policy decision announced in the final budget for 1991-92 (referred to in the last issue of the Bulletin) to convert 37,500 handlooms into 75,000 power loans over the next 10 years. This the industry regards as a move to liquidate

it and throw the weavers and their families out of employment. It will also give authorisation to thousands of benami power looms now operating in the state, on payment of some bribe - and so promote corruption. It is reported however that some handloom weavers in Kancheepuram who have switched over to powerlooms which cost them each Rs.50,000, welcome this change as it will double their earnings. *Finally,* the much publicised plot for a Singapore corridor in MEPZ has not come off and probably will not. The project would benefit Singapore relieving a little its industrial overcrowding. It will also benefit Tamil Nadu where MEPZ will give the zone new life and justify the vast l00 acres of land specifically allocated by MEPZ for this project. On the Singapore side, the stringent policy pressures and complex procedures have held back the industrialists. On the MEPZ side, the policy restriction on foreign investments till recently and the fluidity of the political situation (its instability) has acted as a damper.

Thus in October the trends show that the industrial development of the state in moving forward, inexorably, with the restructuration of existing factories and many capital intensive industries being planned or launched. The negative forces are fewer and are caused by some errors which can be speedily corrected.

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IV. Education, Science and Health

Educational reforms

The statement was made in October in the Assembly that Tamil will be made compulsory in nursery schools which are all using the English medium. It states that orders are soon to be passed making the Tamil medium of learning compulsory in the 30,000 nursery schools in the state with LKG and UKG classes. This wide spread of the pre school education is catering to the needs of the middle and upper classes. The high schools and higher secondary schools in the state are joining on the states' literacy drive. In standards IX and XI the literacy campaign will be part of the curriculum of the student. Each one is to identify the illiterates in the slums and in villages nearly and 'each one teach one' technique is to be used to provide the illiterates with literacy. The Central Board of Secondary Education (CBSE) has also launched a special adult literacy drive in all its schools from October I. To start with, students from classes IX and X are in this programme. Being part of the curriculum, an incentive is the award of upto 10 marks for each student depending on the number of literates developed out of the illiterates. Each school will have its own system to review the programme and for each state will also set up a state wide monitoring committee. All secondary schools of CBSE will be in this programme from the 1992-93

academic year. A SAARC (covering Asia) report issued in October states that 50 per cent of children of primary school age in this region are out of school because of a)poor quality of education, b)irrelevant curriculum and c)the high opportunity costs and d) limited access to educational facilities. Higher education has received a higher priority at the expense of primary education despite its having a higher pay off. It makes a strong plea for preprimary education, which is at present neglected, left largely to private initiatives which copy blindly foreign models or are commercial enterprises. It asks that special attention should be given to non formal education, literacy and the education for women and girls. It proposes institutional capacity for teacher training and production of learning materials of quality which can benefit from mutual cooperation among the countries through the vast communication net work which has been developed but not put to use. At the university level, the annual conference of vice chancellors held this year in Thiruvanthanapuram emphasised: a)the need to reform the system of appointment of vice chancellors so that they can serve fully and freely by making universities autonomous: this would also require that the power of dismissal of VCs should be taken away from the chancellor: they should be under the discipline of UGC: b)on the UGC, there was a demand that the system which over years had become monolithic should be decentralised. Such decentralisation will give the universities greater freedom to formulate their own academic programme within the broad framework of national priorities. This would also correct the present tendency of universities to ignore regional industrial and economic development and concentrate in a routine way on "national passage" : c) the need for financial autonomy, allowing universities greater flexibility in spending government funds allotted to them. This presupposes a certain degree of freedom for them to raise their resources: d)it will also face the serious financial crisis facing all universities - union, state and agriculture. Over 40 per cent of them reported deficits over the 5 year period. The financial picture is dismal for the universities. It was also stated that in view of the growing numbers of students and the difficult and weak financial position of the states, the state cannot go on subsidising them and so they should be free to levy fees, 'receive' donations and raise their own resources, including interest free bank loans for poor students: e)many suggestions were made to improve college education including rationalisation of the existing fee structure, entrance examination for PG studies and the use of UGC grants: it was recommended that the fees, for PG course should be paid by students: f)central advisory boards of education should be set up to avoid changing policies when governments change: g)college development council should be entrusted with the authority to disburse UGC grants: h)as state council for higher education would probably end up being just another body between universities and the government, an inter-university council was recommended with powers to take decision.

Science

Some of the scientific and technological breakthroughs reported in October were earlier referred to under the state's industrial development. India has

expressed its repeated concern on ozone depletion, acid rains and climatic changes and has suggested international conventions and regulations in these issues. Refusing to consider measures to make forestry also an internationally regulated subject and Canada's provision for private industries to cut 20 per cent of timber from the compensatory afforestation taken up by them, India is of the view that forest should remain a national asset and not be interfered with. The urgent need for a global norm on ozone depletion was stressed. The need for liberal consultation on environmental issues especially industrial pollution, impact assessment and waste management was noted.

Health

The extension of the World Bank aided Population Programme in Tamil Nadu to two more corporations, and six municipalities was earleir referred to under Aid. As a result of the universal childhood immunisation programme, UNICEF and WHO report that in 10 years 3 million children were saved every year from the crippling polymyetis and the killer tetanus in the new borns. They are on the point of world wide elimination. A health check up for all will be organised in the state through 10,000 medical camps to be organised over a period of 20 week each of one day duration. Each camp will cover a population of 5000. Minor ailments will be attended in the camp, where further detailed examination is needed, in particular, will be referred to the PHC, or taluk or district HQ hospital or hospital attached to medical college. The Royapettah hospital in Madras has launched a pilot project on child health care by dessiminating preventive health care messages among primary school children, using a few class leaders for this programme. Each class will have a peer leader who will educate the other classmates on basic personal and environment hygiene. This little doctor scheme has been successfully tried out in Indonesia.

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V. Employment and Labour Relations

In the state, graduate teachers report acute unemployment - particularly science, of history and geography teachers. This is brought out in the seniority list of graduate teachers recommended by the Coimbatore employment exchange to the Teachers Recruitment Board for appointment of high school teachers. For the post of science graduate teachers, only SC/ST candidates who have registered before December 31, 1986 were recommended by the Employment Exchange. In the case of the most backward classes, only teachers registered before December 31, 1988 have been recommended. In the case of open competition only those who registered before December 31, 1978 are eligible for recruitment. This means science teachers

from open competition will start their teaching career at the age of 35 and above. In the case of history and geography teachers, the cut off date for SC/ST teachers is Decmber 31, 1986, for most backward classes 31 December 1987 and for backward class and open competition the cut off date is 31 December 1980. So no non backward teacher who has graduated in the 80s and the SC and ST teacher who have graduated in the last 6 years can find employment. Trade union is at last reaching out to rural artisans. The Hind Mazdoor Kisan Panchayat (HMKP) is reaching out to the unskilled rural artisan. Trade union which cover only 10 per cent of the country's work force, has ignored rural workers who are self employed and scattered and face all the perils of the unemployed, under employed, low wages and very bad conditions of work. The HMKP's Dastkar Haat Samiti covers craftsmen who for over two thirds of the samiti, has developed constructive linkages between urban trade union with their counterparts across villages and taluks. HMKP has been able to persuade units like Coal India (CIL) to use handloom fabrics for uniforms, and soft furnishings for all the workers and work places, union to distribute linen for Dastkan bazaars and such mass orders now boosted incomes of the artisans and strengthened the rural artisans both in organised action to better their conditions of work. Four SAARC countries, India, Pakistan, Sri Lanka and Bangladesh have decided to form a Confederation of Foreign Employment Agencies Association to improve and bring about uniform wages, good working conditions and better amenities, to weed out and blacklist undesirable Gulf employment and security agents from the SAARC countries and to formulate uniform rules for the emigration of workers to the SAARC countries.

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VI. Other Items

RDI & ICC

In early October there was the annual general body meeting of Reader's Digest which reviewed and approved the year's audited account and noted the report of the Board of Directors which showed an excellent record of work. It also approved one final instalment of the dividend for the year as recommended by the Board. The India International Centre had two functions: the Standing Finance Committee reviewed the approved audited accounts for 1990-91: it also approved the revised budget for 1991-92 which had to be completely revised to meet the rise in prices. It approved the budget for 1992-93. All these are for presentation to the Board of Trustees and the General Assembly in March 1992. The second event was the seminar on zonal planning for the North East and Eastern zone. For the North East zone there was agreement about its great potential of resources oil, gas, minerals, water, power, but also the great

handicaps that its inadequate infrastructure of roads, railways and other form of transport face. This bottleneck is further complicated by its being surrounded by Bangladesh with only a narrow neck for entry into India. The urgent need to improve relations with Bangladesh to help develop this region was emphasised.

FICCI & ASSOCHAM

In a rather rare event, the chairman for both these top industrial and trade organisation have been elected from Madras, Tamil Nadu and a function to facilitate them was organised at which the minister of commerce was present. The occasion was used to congratulate the government on the economic restructuration and reform under way and an appeal was made to the members of the two bodies to use this opportunity fully to develop industry and trade. Also the problems in this area facing the government, namely the full and precise implementation of the policies by the officers of the government and the need for the two organisation to work with trade unions to develop an exit policy for fairly enterprises as well as identifying sickness in the private sector and taking remedial action on it were emphasised.

Education for Expanding Population and UCO Group

A group of young US students were helped at the institute on the question of education and population. It was noted on the basis of detailed data that the rate of growth of education has not only not checked population growth, basic formal education growth was still lagging. Another problem area noted was the growing problem of educated unemployment, which was referred to earlier in the case of graduate teachers, and the need for the economy to grow in keeping with the rate of growth of labour force entry. A meeting of UCO bank officers and customers was held at the end of October, when the state of banking in the country and particularly of UCO bank was discussed. The means of improving the bank were discussed and it was agreed that UCO bank should develop norms and follow them for safe and profitable banking business.

November Development seminar

The paper for the November Seminar, "Perceived Nature of Crimes in Madras" by A.Sivamurthy together with a summary of the discussion of the paper at the seminar appears as the first article.

Second Article

"A note on Some Random thoughts on Population and Regional Development" appears as the second article.

Special Section

The special section in this issue comprises selected articles proposed for the summer workshop on Management of Renewal Resources held at Hyderabad from June 5 - 8, 1991 as follows:

1. Problems faced in Implementation of Rural Energy Projects in Gujarat and Their Solutions - Anant Vyas, Senior Executive, RED, CEDA Gujarat and K.S.Shah, Deputy Director (Tech), GEDA, Gujarat.

2. Energy use in Agriculture:Efficacy and Sustainability - S.Girlappa, SBI Chair in Rural Development, Mangalore University.

3. Some Problems in the Implementation of Strategies for Managing Energy Demand in the Rural sector - R.Natarajan, Professor of Mechanical Engineering, IIT, Madras.

4. Socio Economic Aspects of Implementing Emerging Technologies such as Improved Chulahs, Solar Cookers and Biogas - Rachel George, Faculty of Home Science, M.S.University, Baroda.

5. Institutional Aspects Of Rural Energy Programmes - P.Venkata Ramana, M.R.Suresh, Veena Joshi, TERI, Delhi.

6. Renewable Energy Programmes - An Assessment of the Prospects - T.V. Venkataraman, Chief Secretary, Govt. of Tamil Nadu.

Book Review

The review by Mr.V. Jacob John of the book Import Canalisation appears in the book review section.

M I D S News

Dr. Paul P.Appasamy attended a Seminar on "Employment Generation for a Million in Three Years in Tamilnadu" sponsored by the Department of Economics, Annamalai University on 9th to 10th November, 1991 and presented a paper.

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Mr.S. Subramanian attended a Seminar on "Employment Generation for a Million in Three Years in Tamilnadu" sponsored by Dept. of Economics, Annamalai University on 9th and 10th November and presented a paper.

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Dr.Padmini Swaminathan attended a Seminar on "Employment Generation for a Million in Three Years in Tamil Nadu" sponsored by the Department of Economics, Annamalai University on 9th to 10th November and was a discussant for a session and presented a note.

She also gave a lecture to RBI officers at the RBI Staff Training Colleve, Madras, on 2nd December, 1991 on "Issues Related to the New Industrial Policy Statement".

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Dr.Nirmal Sengupta participated in a Workshop on "Performance Measurement of Farmer Managed Irrigation Systems", sponsored by the IIMI and INCYTH, held in Mendota, Argentina between 11th to 15th November.

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Mr.S.Guhan chaired a session in the Seminar on 'Gender and Poverty' sponsored by the Planning Commission and the World Bank, New Delhi on 5th to 7th December.

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Dr.C.T.Kurien, delivered the R.C.Dutt Lecture's in Calcutta "On Markets in Economic Theory and Policy" on 5th and 6th December.

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Dr.S.Neelakantan delivered two K.K.Sha Endowment lectures on "Institutions, State and the Individual" in the Politics Department of the University of Madras on 20th and 21st November.

He also presented a paper on "Tamilnadu Social Forestry Programme and its Impact" at ISEC, Bangalore in the seminar on "Towards Greening India's Waste Lands" on 11th December.

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Prof.David Washbrook delivered a lecture on "Some Aspects of Dravidan Movement" on 10th December 1991 in the Institute.

The Pattern of Crimes in Madras City

by

Dr.A. Sivamurthy
Controller of Examinations, University of Madras

The City of Madras, the Capital of Tamil Nadu is situated in the eastern coast of India. It is the 'gateway' to the South India. Its corporate area is 172 sq.km. with a population of 3.2 million in 1981. The city stretches its 19 km length along the Coromandel Coast and extends inland about 9 km at its widest.

Of the urban population of Tamil Nadu, approximately a fifth lives in the city of Madras. It is the fourth largest city in India after Calcutta, Bombay and New Delhi.

The corridors and growth of Madras City were each combination of the two: (1) to the north, the railway and the T.H. Road, (2) to the west, the railway, the New Avadi Road - Konnur High Road and the Poonamallee High Road, (3) to the South, the railway and the Anna Salai; the Great Southern Road. The rapid growth of population is found along the transport corridors. The highest percentage of increase in population is recorded in the north, north-west and west.

The population density around older parts of the city are being continuously intensified. The northern part of the city has a great deal of new industrial development, (small and medium) while residential development is increasing in the major portion of the Southern part of the city.

The per capita income remains exceedingly low with 40% of the population falling below poverty line. The low income group is concentrated in George Town and Perambur areas. The high income group is found in Nungambakkam and Saidapet.

About 30% of the people are crowded together in slums. The slums are scattered throughout the city. Out of the total slum area, 38% is in North Madras, and 62% in South Madras.

Crimes in general and property crime in particular are the big city phenomena in developing countries. The physical growth in various parts of Madras is an impetus to the occurrence of crime because the newly developed areas provide greater environmental opportunity. The structure of Madras city approximates to a semicircle with extensions in all directions expect the east. Early in the development of the city, George Town and the harbour area had become the commercial centre of the city.

TABLE 1

Incidence of selected IPC crimes in Cities in India during 1989

	Murder	Rape	Kidnapping & Abducting	Dacoity	Robbery	Burglary	Theft	Cheating	Counter-feiting	Total
1. Ahmedabad	96	13	125	16	94	810	4186	163	20	13364
2. Bangalore	111	31	80	19	188	1712	7399	727	657	23107
3. Bombay	375	108	267	56	670	2282	14802	1196	47	37309
4. Calcutta	60	27	110	28	155	375	6873	478	56	13738
5. Delhi	295	137	797	11	200	1450	11805	1069	33	28467
6. Hyderabad	123	16	47	13	59	1367	3241	424	29	8063
7. Jaipur	36	19	124	1	35	424	1480	255	15	6269
8. Kanpur	121	18	163	38	115	59	1651	229	39	5526
9. Lucknow	96	30	113	28	119	604	2228	270	5	5336
10. Madras	62	25	33	3	87	461	4415	475	199	14168
11. Nagpur	126	50	74	20	323	856	2612	222	28	9368
12. Pune	81	28	47	21	168	872	2887	137	20	10380

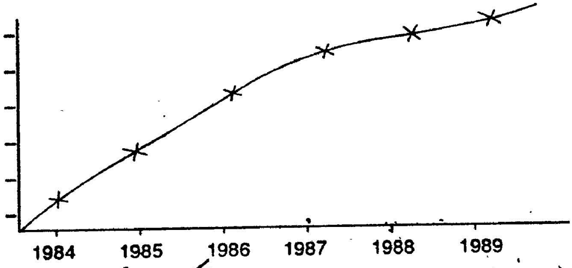
Crimes reported under IPC in major cities

Table (1) shows that Madras is only ranking 4th in the incidence of IPC crimes. Bombay being the first followed by Delhi and Bangalore. The total crimes reported during 1989 in Madras is 14168. It may be noticed that slightly more than 1/3 of the crimes is under the category of theft. Other important crimes are burglary, cheating and counterfeiting.

TABLE 2

The Trend of IPC Crimes in MADRAS during 1984 - 1989

Year	No. of Crimes
1984 :	10561
1985 :	11834
1986 :	13466
1987 :	13827
1988 :	13947
1989 :	14168



However, it is found that the incidence of crime is steadily increasing over the last five years eventhough the rise has not been that sharp as compared to other cities as in table 2.

Temporal and seasonal variation

Conditions of weather, temperature and season have all been mentioned as direct causes of anomalies in human behaviour. May be criminality as well.

When the month and yearwise data relating to occurrence of burglary are put to analysis of variance test, it is found that there is a significant difference between months in the occurrence of burglary. It could be concluded that the occurrence of burglary is seasonal and that the peak month is January, the coldest month in Madras. Winter nights provide better opportunity for committing house-burglary since people go to bed early; the windows and doors are kept closed and roads and streets are deserted at early hours. Under such physical conditions, the offenders have a free access to the houses in which occupants are away without the fear of being watched by anybody.

There is greater frequency of occurrence of hurt during summer months. This may be due to the greater frequency of contacts among human beings or because of the climatic pressure, one may get irritated easily on a slight provocation and this may lead to physical assault.

Season has significant influence only on burglary, hurt and gambling in Madras.

Ecological aspects

An analysis of ecological pattern of crimes and criminal behaviour in Madras city demonstrates that the occurrence of crimes and the residence of criminals can

be explained by physical, social, demographic and occupational characteristics of various census divisions of Madras city. The property crime environment according to the study comprises of census divisions with high occupational status - trade and commerce and service economic prosperity, high educational status, low physical congestion horring density, and low political participation. In such environments the rate of occurrence of house-burglary and theft is higher.

The study also shows that the census divisions characterised by high proportion of membership in SC/ST, low occupational status (workers in transport) low educational status and low housing status (slums) have a high rate of criminals charged with house- burglary and theft.[1]

Commuting of property offenders

The journey of criminals is often the result of differential environmental opportunity. In the localities of North Madras where the environmental opportunity is low, the degree of commuting is relatively higher. In the commercial and high income residential areas of South Madras, the commuting is relatively lower owing to greater environmental opportunity.[2] When these journeys are summarised, it is found that the spatial interaction is more significant in the inner commercial and high-income residential areas. The peripheral zones do not show this kind of interaction since the majority of crimes are committed locally.[3]

The Spatio-temporal variation

The highly crime-phone areas of increasing trend with regard to theft are found in the peripheral parts of Adyar, Anna Nagar, Semblum and Agaram. The localities of North Madras such as Tondiarpet, Seven Wells, Kondithope etc., show a decreasing trend, because they are congested and occupied by low income people.[4]

Mean Centre of House burglary and Pocket-picking

The mean centre of distribution of house-burglary in Madras is found at Thousand Lights. It can be said that nearly 66.15% of the incidence of house-burglary occurs within a radius of 4.10 km from the mean centre. The study also shows that the pattern of house-burglary is not a normal distribution. This skew distribution is influenced by the variation in the land use pattern which is not normal.[5]

The mean centre of pocket-picking is located at the junction of Pantheon Road and Montieth Road in Egmore. It can be said that nearly 52% of the incidence of pocket-picking occurs within a radius of 3.1 km from the mean centre. For a normal distribution, the standard distance will contain 68.27% of the points. In this case it is lower, indicating that the distribution is not normal. This skew distribution is due to the influence of the layout of roads which is radial.

Public perception of Crime in Madras

Fear of crime leads to withdrawal which further increases the danger of crime and therefore fear responses to crime.[6] By an awareness of environmental pressure and their location, we are in a position to know where to concentrate our

preventive and rehabilitative efforts.

There is a significant variation in the pattern of public perception of crime. A study shows that the areas with high score on perception of theft are located far off from the CBD. The lowest score on perception of theft is confined to North Madras only. The perception of theft however does not correlate with actual rate of theft. The study shows that the perception of crime is inversely proportional to neighbourhood satisfaction. In other words, the respondents who are satisfied with the neighbourhood are perceiving less crime in the area, particularly in the North Madras.

The people residing in their own houses perceive more crime as compared to those who are living in rented houses. Those who reside away from the police stations perceive more crime as compared to those who live near the police station. The respondents who read local news papers perceive more crime as compared to those who read English newspapers only. The score on perception of crime decreases as the number of years of stay increases. In other words, those who stay longest tend to depreciate the crime rate. The perception of crime risk increases with the experience of victimisation in the past.

Conclusion

Behaviour is reaction to forces in the environment. Defensible space means creating territoriality, attachment, possessiveness and control in order to inhibit crime. To defend means to control space which is potentially dangerous. The above analysis helped us to identity the location of crime-phone areas and also the relationship between crime and the changes in the physical, social and land-use characteristics of specific areas of Madras city.

The newly urbanised peripheral areas of Madras city provide better opportunity for criminals than the old inner areas.

In the law enforcement planning the attention may be focussed on the effects of changes in the land-use and transport network as well as dynamics of social process. The police must know much earlier, the growth of environmental opportunities for crime.

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Summary of Discussion

The author elucidated the physical growth in various parts of Madras over the last two decades as being an impetus to the occurrence of crime since the newly developed areas provide greater environmental opportunity. Early in the development of the city, George Town and the harbour area had become the commercial centre of the city, he further added.

It was also mentioned that under the Indian Penal Code (IPC) Madras ranked fourth in the incidence of Crimes, Bombay being first followed by Delhi and Bangalore. He further emphasised the incidence of selected IPC crimes in cities in India during 1989 with its various manifestations.

Among the casual factors emphasis was laid on weather, temperature, and season as direct causes of anomalies in human bebaviour. Ecological pattern of crimes could also be explained by physical, social, demographic and occupational characteristics based on various census divisions of Madras city. The census divisions comprised of high occupational characteristics, trade. commerce and services, economic prosperity, high educational status, low physical congestion and low political participation.

The author in his presentation also used numerous transparencies to illustrate commuting of property offenders, spatio temporal variations of highly crime prone areas and the mean centre of house burglary and pocket picking. According to him, nearly 66.15% of the incidence of house - burglary occurred within a radius of 4.10 km from mean centre and 52% of pocket pickings within a radius of 3.1 km from the mean centre.

The author was however critical of the public perception of crime in the city and said that there was a significant variation in their pattern.

In the discussions that followed a query was raised by a participant on the incidence of IPC crimes during 1989 being lower in Calcutta than in other metropolitan cities. One of the participants also pointed out that in the event of rise in population, absolute number of crimes rose but relative crimes in terms of population fell and this hypothesis needed clarification.

One of the participants also drew attention to the parameters of offenders - whether they were residents of the city or outsiders or people coming from other states and those that were of a migratory nature.

A crucial point raised was the caution to be exercised while interpreting gross aggregate figures. In this context it was pointed out that the study based on every 1000 inhabitants as in the case of number of crimes per 1000 relating to various dimensions of crime was very essential.

Social scientists ought to give more attention especially in the Calcutta context where people had a distinct culture and were better off at the slum level, with higher average incomes which reflected a sense of togetherness among the slum dwellers.

Another comment raised was the issue in discussing the nature and extent of IPC crimes with the Police personnel and to address them which may have policy implications for their effective implementation.

In the case of thefts in Madras Port Trust and pilferage of goods laden lorries at traffic signals, check posts and junctions, the involvement of an organised gang was suspected in such pilferages rather than the slum people. In fact the slum people were being used as pawns by such people for their own vested interests, it was asserted.

It was also pointed out that where the infrastructural facilities were undeveloped it was conducive to crime as in the case of isolated houses in villages and those that were away from towns. Linking the incidence of crime and relating it to population would give a different picture and there was also a positive correlation between slum dwellers and criminal activity.

The assertion that there is an association between crime and high population of SC/ST was however questioned.

On the question of crime against women it was pointed out that as long as it offended their modesty it was a serious criminal offence. It was also pointed out that over the past 10 years, women criminals themselves had increased especially pick pockets.

The chairman Dr.P.Chandra Sekharan, Director Forensic Sciences Department, while summing up the proceedings agreed with the view that too much of police deployment was there where it was least needed. However it was essential to bring the public and police closer. Therefore a change in the perception of crime by the public themselves would go a long way in mitigating their own hardships to a greater extent.

V. JACOB JOHN

Some Random thoughts on Population and Regional Development*

Prolegomena

The relation between Population and Regional Development in India was recognised from the start of National planning, when it was decided that Plan asistance to the states will be divided with the following weights: population 6, income tax effort 1, development effect 2 and others 2. By giving the largest weight to population relative to income and performance, it was recognised that development must result in inter-state income redistribution and correct inter-state income inequalities. This means that the goal established was that of a new regional economy which would be characterised by a different level of income distribution and a new output structure, involving optimum utilisation of material and human resources and maximisation of productive efficiency. From that point of view, the traditional division of the country into 5 regions and the percentage distribution of population as between them from 1901 to 1971 is relevant and is set forth in the table below:

TABLE 1

Region	Area in Kms 1971	1901	1911	1921	1931	1941	1951	1961	1971	1981
Northern (78 states & Territories)	21.79	11.30	10.52	10.56	10.66	10.95	10.59	10.94	11.27	11.4
Eastern (12 states)	20.93	24.71	24.94	25.02	25.11	25.40	24.90	25.88	26.00	26.3
Central (2 states)	22.42	27.47	26.81	24.20	25.50	25.27	24.73	24.10	23.71	24.1
Western (3 states & 1 UT	15.45	12.17	12.62	12.56	12.91	12.92	13.55	13.86	14.24	13.2
Southern 4 States & 2 UTs)	19.41	24.75	25.11	25.66	25.84	25.46	26.17	25.17	24.75	24.8

Source: Census of India

* A note by Dr. Malcolm S. Adiseshiah for the 19th Annual Session of the Indian Science Congress, Calcutta, August 16, 1991.

The table shows a certain degree of stability in the population percentages as between the 5 regions in the 8 censuses, with a trend to a decline in the central region and an increase in the western and eastern regions.

Science, Technology and Development

There is a close nexus between Regional Development, Science and Technology and Population to which attention is next drawn. The 5 regions referred to above have been further divided on the basis of (a) homogenity in demographic structure, that is, the impact of the demographic structure (density and growth rate of the population), (b) resource potentiality, particularly areas with a strong natural resource base as against those with a weak or nil base, and (c) the level of socio, economic development, into 19 sub regions grouped around three broad heads.[1]

First, the dynamic group (comprising the West Bengal sector, the lava area of Gujarat and Maharashtra, Tamil Nadu, the Punjab plain and Ganga-Yamuna doab area and the South Eastern Karnataka plateau, which feed developed industrial areas and urbanisation with science and technology inputs that both keep moving knowledge and information forward, and use and exploit all natural resources, for absorbing population from the over populated rural hinterland. Here there are endless possibilities for the application of science and technology to both better the levels of living of the populations and spread them out more .even spatially.

Second, what is termed as the prospective group, comprising the north eastern area with its plentiful resources, the Godavari basin with its marine, weather, forest resources and more recently its crude oil and associated gas potential, the Aravalli hills and Malwa Plateau with its unique copper and zinc resources, the western and southern part of the Karnataka plateau including Goa noted for its iron ore, manganese, limestone, forests and hydel resources awaiting the development and the possibilities of application of science and technology for opening up its vast mineral and other resources, including the removal of the burden of tradition, superstition and inter-state feuds, holding up its technological and social transformation and pushing forward the small industrial and agricultural models and nuclei that have been recently established, and Third the problem group comprising Middle and East Ganga Plain which is deficient in almost everything, the Orissa and Kerala coast with their abundant marine, forest and hydel resources and the North East Karnataka, Rayalaseema, Marathwada and Konkan which have high potential of mica, limestone, manganese resources, facing in most areas poverty and destitution, the major reason for which is their over population expressed in their per km density being 3 or 4 times that of India as whole, along with a very weak and poor natural resource base.

Migration

Another issue that the question of population and regional development raises is with regard to migratory movements which are a spatial phenomena, involving movement and communication over space. Is there a model or pattern that can be derived from these movements? There are theories which suggest a standard pattern.[2] But those seem to be derived from metropolitan travel movements and industrialised countries. More generally, the spatial movements of a population are sparked by the desire for improved levels of living, rapid economic growth and a better physical and human ecology. Regional development arises out of the dispersion factor, the centrifugal elements in operation among the population. Migration which is both a cause and consequence of regional development is a fall out of the operation of both centripetal force leading to clustering of the population and its activities, and centripetal forces which lead to its dispersion. One is seen in the immigration into towns and cities and the other is seen in the outmigration from the rural areas. Regional development at any point of time is the net result of the pulls and pushes exerted by these forces. Applying these factors to a country, population movements are described as involving concentric rings around á growth pole,[3] or a homogenous plain with an even distribution of natural resources and population[4], or one comprising a heirarchy of central places from the lowest order to the highest order centres, involving the clustering of spatial activities, specialisation and division of labour among them.[5]

Spatial Planning, including migratory movements in India are the foci of population and region development. As earlier noted, migration - both in migration and out migration - is the outcome of people's desire to improve their standard of living, starting with earning a little more. The censuses contain abundant data on migration in the country. These show a certain stability in the total population involved in these spatial movements at around 30 per cent. Taking the 1981 census, which is the latest census for which migration data is available, it is seen that 166.7 million out of a total population of 548 million were involved in migration. The analysis of the 1971 and 1981 census shows that urban India is growing at 46 per cent, against the country's economic growth of 24.46 per cent. This trend will continue as the growth rate of the 4 main metropolitan cities between 1985- 2000 set forth in the table 2 shows:

TABLE 2

	Population in million				Growth rate (percentage)	
	1985	1990	1995	2000	1970-80	1980-90
Calcutta	11.0	12.6	14.5	16.6	30.0	32.0
Bombay	10.1	11.9	13.8	16.0	36.0	40.0
Delhi	7.4	9.2	11.1	13.3	49.0	55.0
Madras	5.2	6.1	7.1	8.2	36.0	38.0

Source: UN Estimates and Projections of Urban Population 1982.

The above table highlights the overall migratory movements in India and shows that it shares the characteristic migration pattern of underdeveloped countries. This rural-urban migration is determined by

* Cost factors : the cost of migration which varies with the distance to be covered from exist to entry

* employment and income perspectives based on information from relatives in urban areas, which itself may be based on rumour or guess work

* mental make up: willingness to take action on the lottery of urban like

* other socio, economic, cultural factors such as kinships, caste etc.

The major feature of this spatial movement is that the majority of the people on the move are in the middle adult age groups, with a low dependency ratio, comprise majority of males, are illiterate or semi-literate, with low level wages, skills, and productivity.

The 1971 ans 1981 census show that capital investment is heavily concentrated in some 20 urban agglomerations as against the majority of other towns. Migration flows in increasing volume to areas of low agricultural productivity, that is areas of high investment and tractorisation do not attract labour migration, whereas labour intensive traditional methods of cultivation encourages increased migration flows.[6]

The continuing and expanding rural - urban migration has given rise to slums, street sleeping and squatting. To deal with

or atleast ameliorate this problem, rural development involving accelerated growth of farm production, the further growth of non farm activities, the employment relief programmes and the land reform programme, programmes equalising or reducing inequality in income and assets distribution, and an effective education programme involving improved and high skill formation in rural areas, needs acceleration. At the receiving urban end, the informal sector and tiny and small scale sector can and do help the employment of the migrant labour force. There is need also to address the housing needs of the urban poor, of whom rural migrants are major part, through low cost housing, sites and services, and community development support.

A Research agenda

In this kind of spatial planning, population, and regional development, there are unanswered, unresearched issues to which attention needs to be paid urgently. These have been debated and attention needs to be paid urgently. These have been debated extensively.[7] Following this note, I would set forth the main issues thus:

* The measurement of gains and losses of spatial planning for regional development.
* The question of over urbanisation of the country
* The cost of continuing rural/urban migration in:
    * The misallocation of labour and human resources between rural and urban areas
    * The costs of providing the minimum infrastructural facilities for rural migrant in the urban area versus their provision back home in his rural home site.
* The need for area based technical education and applied science and technology in the rural regions to meet rural infrastructural and human needs.
* How science and technology application can deal with the intractable problem of rural under-employment.

The Rural Development Strategy and population policies that would fit into various regional development problems and scenarios.

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Book Review

Import Canalisation : Dilip K.Das, Sage Publications, New Delhi, 1991, pp.151, Rs.185/-

The above study commissioned by the World Bank has two basic focus viz., elucidate conceptual aspects related to import canalisation and canalisation as a policy instrument for Less Developed Countries (LDCs) than the Developed Countries (DCs). Secondly, it examines basic issues related to import canalisation with the help of a case study of India. The book has nine Chapters with 3 appendices giving details of various questionnaire on canalisation.

Chapter I is an attempt at elucidating the concept of canalisation. Functionally canalisation is a mechanism of import by the government sponsored organisations, when such an agency determines the goods to be imported as well as their price and quantity, imports are canalised. The author at the outset has admitted that import canalisation had evaded a neat and precise definition (p.15).

The distinction between import canalisation and free trade is also drawn. Under free trade regimes basket of goods to be imported is guided by profit motives led by the "invisible hand" and the price, quantity, direction of trade are also determined, whereas such manoeuvr-abilities are limited for canalising agencies. These agencies are state owned, directed, managed or controlled. While public ownership is not a necessary condition, public control and management implies trade by bureaucrats.

The conceptual and theoretic part of the analysis pertains to Chapter II and III as well. The neo classical prescription of free trade and liberalised imports with a greater role for price mechanism is based on market forces to deliver the goods. This however in reality does not work as there is asymmetry in market power between DCs and LDCs and also among LDCs themselves.

Chapter III mentions that as long as canalising agencies import for the whole country they are bulk buyers in international markets and hence do possess monopsonistic transactional price

making powers. But surprisingly all of them do not exploit such power. The author has shown clearly why prices are lower in monopolistic market than under competitive situations (Fig.3.1, p.50) and the disadvantages of holding monopolistic powers in the domestic markets (Fig.3.2, p.51).

In Chapter IV the Indian case study is basically meant to critically evaluate the role of canalisation of imports in India with respect to the officially stated objectives: to desire benefits from bulk buying, implicit in them are the idea of improving terms of trade, benefiting from the scales of economies, ensure equitable distribution of scarce resources of imported materials among user industries both small and large that need them; eradicate malpractices of underinvoicing and overinvoicing in import trade; mop up large premia on imported items that arise from the scarcity of these items in domestic markets and enhance bilateral trade and payments with Centrally Planned Economies (CPEs). The canalised products selected for study are: edible oils, newsprint, natural rubber, iron and steel (pig iron), carbon steel, alloy steels); non-ferrous metals (aluminium, copper, nickel, tin, zinc) and steel scarp and sponge iron (p.57).

Chapter V discusses Indian canalisation process, organisation and modalities in detail. The State Trading Corporation (STC) is an autonomous body owned by Government of India and the powers are vested in the Board of Directors. The principles of specialisation in commodities for trade date back to 1963 and hence the Mineral and Metal Trading Corporation (MMTC) was created.

Chapter VI discusses the decision making process along with the various influences and control variables. Until *Perestroika* the CPEs had monopoly over trade. The free trade regimes in hard currencies of US, W.Europe, and Japan linked to India had implications for Indo-Soviet trade.

Chapter VII examines the specific experiences of major industries that were depended on canalised raw materials and inputs. India during 1930's was the largest exporter of *Edible Oil* in world markets and continued to do so till 1950's. Presently the trend is reversed basically due to higher domestic demand. Whether edible oil should be decanalised or the present policy should continue, the Vanaspathi industry is divided on this issue. In the case of *Newsprint* imports, the stringent procurement quotas were viewed as cumbersome and the task of stock management proved onerous.

For *Natural Rubber*, entry into international markets by STC was not considered as proper, as the practice was adopted only in the lean season, which need not necessarily be the period when international prices are lowest, and moreover buy only when the committee authorises them to do so. The large tyre manufacturers that import on advance and rep licenses frequently buy at better CIF prices than STC. In the case of *Iron* and *Steel*, imports through MMTC is different from other items and industrialists requisition is for number of heterogeneuous items made of iron and carbon sheets, low carbon steel sheets, cold- rolled, non grain oriented electric steel sheets, stainless sheet flats etc. Due

to variety of imported items unified price structure is not maintained.

In Chapter VIII the author has raised some questions regarding functioning, efficiency/inefficiency of the Canalisation process objectively. From Indian experience there seems to be little evidence of monopsonistic gains and benefit from scale economies mainly due to the small purchases from the stand point of international markets. In actual practice the foreign exporters to Indian Canalising agencies perceive them as "opportunity markets" (p.119) and the structure of international market for several commodities and raw materials is oligopolistic in nature. The decision making process of STC and MMTC has been curtailed by bureaucratic factors and business acumen tends to be replaced by risk-averse and procedure oriented approach in India. The empirical data however does not indicate economies of scale and trade with COMECON countries by STC and MMTC seems to be marginal.

Chapter IX is the concluding chapter and defines the policy options at hand.

However, the weakness inherent in the system has to be viewed in a global perspective. The lack of professionals suitable for expertise and specialised knowledge in import trade is only one. aspect of the problem. Bilateral agreements and counter trade arrange- ments between DCs and LDCs and among LDCs, exists. Multilateral trade forum's like GATT and UNCTAD are forced to be bilateral in their functioning thereby catering to the needs of DCs themselves. This has implications for LDCs terms of trade and weaken their bargaining power considerably.

The author's plea for partial canalisation (p25) where imports are permitted by private houses or by user industries under the supervision of a pre-specified canalising agency has to be on a priority basis based on thorough study and scrunity to safeguard national interests.

The author mentions that in designing the study a reasonable indepth examination of a few product has been preferred to an essentially superficial and wide coverage (P.57). Accordingly products like crude oil and petro chemicals, fertilizers, synthetic yarns, rock phosphate and drugs have not been covered. Incidentally the above items. cannot be ignored even though they involve complicated policy questions and canalisation is only a minor variable in the industrial policy relating to them as justified by the author.

The Indian experience being relevent in numerous LDCs which are presently groping with import canalisation issues (p 56) needs further study and analysis. Even within SAARC or ASEAN region, trade regimes are based on national priorities. Replicability of their role is a questionable proposition with socio/ economic and geo-political considerations playing a major role in both inter and intra-trade relations of these countries.

Whether canalisation has improved terms of trade; scale of economies, reduced unit costs of imports is indeed a difficult question to answer because the very definition and scope of the concept of canalisation is open to debate and

interwoven with the intricacies of the various political interventions and priorities of individual countries.

More attention on monitoring of the scheme and treating buffer stocks as a crucial price stabilisation mechanism and whether the desired results has been achieved in this direction through the process of canalisation is also desirable. Neverthless the authoritative work is indeed a significant contribution to the ongoing debate concerning trade policy regimes of LDCs.

The policy makers and bureaucrats in the field of international trade have a lot of home work to perform as several gaps in this area has been exposed by the author. The author has taken pains to criticaly examine the whole question of import canalisation from a policy perspective and the study has been one of the very few attempts in this direction.

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Problems Faced in Implementation of Rural Energy Projects in Gujarat and their Solutions

by

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Energy plays an important role in the life of rural and urban population. The rural population which forms about 78% of the total population in India, uses energy predominantly for cooking, water heating and space heating. Agriculture consumes about 12% of the total energy consumed. Gujarat Energy Development Agency (GEDA) was constituted by the Government of Gujarat in 1979 to promote renewable resources of energy. GEDA has contributed significantly to the development of the rural areas of Gujarat. Programmes have been chalked out to bridge the gap between energy demands and supply. Strategies of development of rural poor are often dependent on energy resources available locally. Presently the country is going through a serious energy crisis which can inhabit and strangulate the growth and development. It is estimated that by the end of the century, the chunk of the total energy requirements of the country will have to be met from new and renewable energy sources. GEDA's primary objective is to promote the hardware dependent on renewable energy resources. The main areas of thrust of GEDA's projects are solar, thermal, solar photovoltaic, wind pumping and wind turbine generators, biomass gasifier, biogas programme, rural energy surveys, urjagram projects, integrated rural energy programmes (IREP) and mass communications.

Detailed study of the energy consumption and energy resources

availability is a pre-condition to implementation of energy projects. Such a study was sponsored by GEDA covering 50 villages in seventeen districts belonging to different agroclimatic regions of Gujarat.

The study was conducted in 1981-82 jointly by Jyoti Consultants, Baroda, The Indian Institute of Management, Ahmedabad and Bhavnagar University. Jyoti Consultant carried out the survey work of Central and South Gujarat, Bhavnagar University, Kutch and Saurashtra and IIM was entrusted the survey work of North Gujarat. The consumption pattern included domestic activities (cooking, lighting, water heating and space heating) Agriculture, transport, industry and artisans. A total of 1334 households, large farmers and artisans were surveyed. A survey of 32 industries was also conducted as a part of the study. The study included assessment of the potential of locally available resources which can be used as alternate renewable energy resources. The end result of the study was expected to assess the gap between the demand and supply of energy in rural areas. All the the studies highlighted a common factor that the domestic sector consumes by far the largest proportion of the total energy consumed in rural Gujarat. On an average crop residues produced and total sold fuel used can be taken as an index of pressure on village forest lands. The deficit that remains in the villages varies from 13 to 80%. It was observed that forests can be a major source of fuelwood supply.

However if each district were to depend only on its own production of wood only one district (Banaskantha) could meet its need and have some surplus. It was observed that some districts like Mehsana which is almost devoid of forests could meet scarcely 10% of its need. With the increase in population and even increasing demand for fuel for cooking, measures like energy plantation, biogas plants, improved chullas, solar thermal devices etc. can only sustain the capability of the region to supply itself with the energy sources required. The studies indicated that the use of kerosene for cooking will grow. It is already being used as supplementary fuel in some of the villages surveyed. The quantum of energy used in lighting of domestic households were also surveyed in the three studies. Even after electrification, the study indicated that kerosene has remained a major source for the lighting need. It was noted that in agriculture sector water lifting and agriculture transport are the major energy consumers, and there is a big potential for energy savings. These studies identified the problem areas which needed attention on priority basis.

The main findings of the Rural Energy studies were as follows:

Priorities in rural energy sector Gujarat State.

Total fuelwood needed 133 mil. tonnes per anum.

Available fuelwood	49 mil. tonnes
Energy gap	84 mil tonnes
Availability of forest wood	20 mil. tonne
Net energy gap	60 mil. tonnes

This is an indicator of crisis to come in the face of growing population. The studies highlighted the average energy required for various activities.

1.	Water heating	2.2 Kg/HH/day-wood
2.	Space heating	43.60 Kg/HH/season -wood
3.	Cooking Fuel	1-1.5 Kg/Capital/dy of - wood
4.	Lighting	3.8L/HH/month of kerozene or 19-38KWH/HH/month electricity.
5.	Agriculture-Men output	52 K Cal-Hr.
	Bullock pair	52 K Cal-Hr.
6.	Estimate of energy required for wheat cultivation	0.45-1.64 Mil K.Cal.Per ha.
7.	Average yield of wheat	300-500/Kg/Ha

The studies confirmed the need to implement forestation in all government wastelands, forest lands, roadsides, railwaysides, canal side plantations, village common plots and periphery of private farm lands. The studies also indicated the potentials for gobar gas, for example North Gujarat has a potential of meeting 40% of calories required in cooking. As the rural energy survey studies were carried out by 3 different consultant agencies, problems in approach, methodology and reporting were anticipated. However, the objectives, methodology and other details were discussed jointly by the principal investigators and GEDA and diversities and variations were minimised. It was decided to bind the studies together in one volume so as to build a comprehensive uniform picture of the energy scenario in rural Gujarat.

In implementation of the rural energy survey quite a few problems for the investigators were presented. Further to identifying the 60 representative villages, ideally 10-15% of the population should be surveyed for the reliability of the results. These problems are solved by deciding on a norm that 50% of the population or 100 households whichever is greater shall be surveyed. The proportionate random sampling technique based on land holding sizes was applied. The sampled household consisted of landless labourer, small and marginal farmers, large farmers and artisans. Such a survey is not an easy affair and the target population had to be informed, taken into confidence and educated regarding the objectives of the studies. In all the three studies of voluntary agencies which were already working in the area were involved. These agencies made it possible to get cooperation for the enumerators when it come to the household surveys. The presence of a person representing the voluntary agencies ensured that the householder answered the question in the survey seriously and truthfully. Participation of the rural population is extremely vital in such surveys.

Participation in this joint assessment of local situation through voluntary agencies also helped to promote our programme philosophy. People were made aware about the energy crisis and the possible solutions. The issues of socio-economic

development of rural areas through planned energy inputs were also discussed with the villagers. Energy survey studies have highlighted a good deal of commonality in the energy consumption patterns in domestic agriculture, industry and artisan sectors in the rural areas. Based on the information obtained, GEDA has planned decentralised, area specific, energy packages utilising locally available renewable energy resources. GEDA has also realised the relevance and importance of tackling the energy problems in an integrated and comprehensive manner.

The Department of Non-conventional Energy Sources (DNES) Ministry of Energy, New Delhi and GEDA are equal partners in promotion of renewable energy resources to minimise the energy crisis in rural Gujarat. Voluntary agencies who are involved in the implementation of the programme and the villagers have also been made to share the responsibility of achieving the goals of GEDA/DNES with meaningful impact.

Integrated rural energy centres (Urjagrams) were some of the primary projects of GEDA. The agency made efforts to satisfy the energy needs of village by generating energy locally in a decentralised fashion using the locally available resources. GEDA presently has 31 Urjagrams all over the state of which 14 can be called full-fledged. One such Urjagram Khandia, was set up in 1983. GEDA, Gujarat Electricity Board (GEB) DNES and Khandia Gram Vikas Mandal were the partners in this experiment. The lighting energy needs of more than 100 households and cooking energy needs of 47 households were satisfied by means of biogas.

A community colour television working on photovoltaic and a solar water heating system were provided for the community use. Improved smokeless chullah was provided to each household. Electricity was generated using a gasifier engine generator set.

30 (KVA) and electricity was supplied for domestic consumption and street lights. On an average electricity was supplied for about four hours a day. A community biogas plant of 60m3 capacity supplied piped gas to those who opted to use biogas for cooking and water heating. Nominal charges were collected for the electricity and the gas consumed. GEDA and a voluntary agency Bhailal Amin Trust shouldered the responsibility of the operation and maintenance of all systems for about 2 years. In 1985 Khandia Urjagram was dedicated to the people of the village and Khandia Gram Vikas Mandal took over the operation and maintenance of the project. Khandia Project posed many problems from time to time. It was realised that the maintenance of the engine, generator, gasifier and distribution lines needed trained, competent persons. Efforts were made to train local youths in carrying out such duties. We were successful in minimising some of the problems. However major repairs had to be brought to Baroda. Some of the repairs took a long time and this period without much needed electricity brought about complaints from the villagers. This problem was solved by installation of a stand by spare gasifier

engine generator set. This corrective measure brought about some relief. 2 years of experience in operation and maintenance of the system taught us that regular servicing and maintenance of the engine generator is essential. We signed service contracts with a diesel engine mechanic and an electrician to service the sets after every 300 hrs of usage. However problems of breakdown continued. Maintenance of a diesel engine generator in a village far away from a city is a difficult proposition.

Especially during the monsoon months the village could not be reached by road. Heavy loads could not be carried to and from the village. These conditions caused breakdown in regular supply of power. The dissatisfaction of the villagers grew every time there was a disruption in supply. It was decided that the village may be given some photovoltaic street lights which would light the streets into early hours in the morning. The solution made quite a difference. The streets were lit up and brought a feeling of safety to the villagers. However the Gram Vikas Mandal failed to live up to its responsibility and people misused the batteries meant for photovoltaics, to play public address systems etc. Due to the misuse and careless maintenance photovoltaic lights were often out of use. The Gram Vikas Mandal could not collect bills for the electricity consumed and the gas used for cooking. To add to all these problems, the nature cursed Gujarat State with 3 years of drought. The anticipated income from the energy plantation disappeared in thin air due to drought conditions. GEDA came to the rescue of the farmers when the village well etc. dried up and drinking water supply almost dwindled. Two borewells were sunk by the agency which brought about a sigh of relief as water was made available for the human and animals. One of the borewells had a submersible pump which was energised with electricity. The other well was installed with a turbine pump which was attached to a gasifier diesel engine system. Both these systems provided some surplus water which was used to grow the much demanded green fodder for the live stock. The drought conditions continued for such a long time that most farmers were unable to feed their animals. The population community biogas plant had to be closed down for the want of dung and water.

Khandia has been a great learning experience for GEDA, the villagers, GEB, DNES and all the development workers. Khandia project highlights the socio-economic and institutional issues involved in implementing rural energy programmes. The primary lesson learnt from Khandia is the fact that the best high technology implemented to solve the rural energy crisis does not give the desired impact if the population cannot afford the technology. Provision of energy to rural areas is only a means and not an end in itself to rural development. Provision of energy alone does not solve some of the most taxing problems in rural areas. However, an entry into a village on pretext of providing energy, quite often brings along other need based technology along with it. Increasing the purchasing power of the villagers is the priority of the day. Often supply of drinking water is perhaps more of a priority than the energy required for lighting houses etc. People of Khandia were not quite responsive to accepting

piped, clean and easy to light biogas fuel. Our assumptions that people will readily accept this fuel in preference to burning wood was not correct. The villagers could not be convinced to pay for the piped gas fuel. Most of the villagers were getting firewood free of cost and they expected the biogas to be supplied free of cost as well. They did not put any opportunity cost on the time spent by women in collection of firewood. Unfortunately, Khandia was given so much of publicity in terms of taking VIP visitors to see the project that the villagers started treating this project as GEDA's project and not their own. They quite often verbally expressed their feelings openly. This sort of feelings was also a reason for non- cooperation of the villagers. The villagers felt that in trying out new systems of renewables, we had deprived them of the commercial source of energy. Active participation of the beneficiaries in the programme designed to bring about their development is of utmost importance in achieving positive results. GEDA's all efforts to make people participate in one or other income generating activities failed. Ambar Charkha, plastic bag making, poultry farm, dairy farm, seed plots etc. did not succeed. The major activity in which the villagers participated actively was the loan of quality seeds and fertilisers. The Khandia Gram Vikas Mandal distributed these commodities at 50% of the cost with a condition that the farmer will pay the remaining 50% balance after the harvest of crops. Actually this system did not work well as only those farmers who had some water resources of their own could produce crops. More than 80% of the farmers produced meagre yields and could not pay up their loan amounts. Water resources are the top priority for the farmers and any development activity which ignores this reality will fail to have the desired impact. It was observed that the Khandia population did not have the desired cohesiveness and linking for the communal services. Individual selfishness and vested interest usually came in the way whenever some new developmental activities were planned.

Khandia project has highlighted the fact that cooperative infrastructure is an absolute necessity for the operation, maintenance and day to day management of a project. Participatory approach to projects is the only way to make projects self sustaining and viable. Most hightech projects will not have the desired impact if it is not made appropriate to the local situation and acceptable to users. Our role as management, technical back up support unit should not be underplayed. Our systems must be technically reliable and the users must have full confidence in us to help them out in the time of breakdown and crisis. A project can fail for the lack of after sales service. An integrated approach is a must in promotion or Urjagrams. Villages have to be energised and not just electrified. Economic and other priorities of the villagers should also somehow be addressed.

Khandia experience was quite useful in implementation of another Urjagram, Methan, taluk Siddhpur District, Mehsana in 1967. The implementation of this project was planned in such a way that active participation of the villagers was given the top most priority. Methan Urjagram started as a community biogas project and later on it was declared as an Urjagram with the

implementation of improved chullahs, solar cookers, photovoltaic lights, improved bullock carts and energy plantations. The unique feature of this Urjagram is the monetary contributions of the 320 consumers of biogas adding upto more than Rs.120 lakhs. Secondly. the consumers took a vow to loan dung to the biogas co-operative and accept slurry fertilizer in return. More than 80% of the energy need of the village is being satisfied by biogas fuel which on an average is supplied for 6-8 hours per day. The village co-operative has managed, operated maintained and repaired this project since APR 1987. This is an example of true participation of people in running their own affairs. The society on an average generates an net surplus of Rs.15000 per annum. Bonuses have been distributed to the members of the co-operatives for the years 1988-89-90. Energy inputs in the form of easy to ignite, smokeless piped fuel has contributed to improving the quality of life of the women folk of the village. The slurry fertilizer rich in Nitrogen, Phosphrous and potash has helped to yield more crops and augumented farmers savings. This project on an average creates equivalent of 1 lakh mandays by direct or indirect employment. This is an example which highlights self reliance and economic viability. All development projects including energy supplementation if planned properly with the active participation of the beneficiaries succeed in making the rural population self reliant and economically capable of running their own shows.

In the year 1988-89 Urjagram Kalyanpura was implemented with a 4KW photo Voltaic Power Plant to satisfy the energy needed for lighting of the houses and the streets. This power plant energises 110 domestic lights, 16 street lights and energises a television set for 3 hrs. a day. Kalyanpura is a small village in Anand Taluka of District Kheda. The village has a population of about 300 persons with 57 households. All the houses are made smokeless with improved chullahs, 4 households have 2M3 family biogas plants and 6 more families have shown interest in having bio-gas plants. An improved bullock cart, 5 Gasifier Engine Pump Sets, Solar Cookers and a Solar Water Heating System have been installed initially. Energy inputs in the form of lights, television, biogas plants and improved chullahs have improved the quality of life of the villagers. The housewives are very happy with the latest scientific gadgets to help them in cooking and the television to provide them with entertainments and news. The women of Kalyanpura breathed a sigh of relief with the installation of Gasifier Engine Pump set on the Village well. The drudgery of pulling buckets of water from a 70ft. deep well has been eliminated from their life with the help of appropriate energy inputs. This project, like Methan Urjagram was planned with the active participation of the villagers. The villagers were informed about the project right from the stage of planning. They were asked to commit themselves in co-operating all the way in the implementation of the project. The co-operative infrastructure was created in the village and nurtured to such a level that now they are able to manage, operate and maintain on their own. Light bills are collected by the management committee of the society. The enthusiasm of the villagers in their own development surfaced when the

co-operative society requested us to do the needful to establish postal services, bus services and a co-operative milk society in their village. We saw this as an opportunity to win the confidence of the people and went out of our way to get postal services and established a co-operative milk society in the village. Integrated approach to solving the energy problems of the rural population is definitely the effective way of implementing projects.

Recently an additional 4KW photo Voltaic Power plant has been implemented to provide lighting for longer hours and create some scope of use of fans. The villagers have requested for a 1000 ltrs. per day of solar water heating systems to satisfy their needs for hot water. A plan has been worked out for this as well. GEDA plays a resource person role when a project is handed over to a village based co-operative society. Efforts are made to train the villagers to carry out small repairs and maintenance. Villagers are also trained in management of the day today problems in operation of the system. GEDA staff remains as a member of a coordinating committee established in the village. A continuing contact is maintained with the project and whenever the villagers call upon our services, regardless of day or night a resource person reaches the villages to solve their problems. Technical breakdown in the systems have often created social sparks in the community. A continual backup support system both technical and in management are essential recipe for the effective operation of a project. Uptodate GEDA has received sanctions for 31 Urjagrams out of which 14 have been implemented.

Unlike Urjagrams Integrated Rural Energy Planning Programme (IREP) is a macro level planning of Energy inputs for improving the quality of life of rural population. IREP aims at block level planning. Our experience in IREP projects is limited to implementation of hardwares in 15 blocks in Gujarat. Efforts are being made to involve agencies like the Forest Department, District Rural Development Agency, Rural Electrification Corporation etc. GEDA has relied quite heavily on voluntary agencies in implementation of IREP programme. The voluntary agencies have worked as a two way channel between GEDA and the beneficiaries. The involvement of voluntary agencies has solved the problems of identification of beneficiaries, collection of contributions, implementation of hardware, operation, maintenance and training of persons at the village level. Voluntary agencies have also acted as a channel for providing feed back on GEDA's projects. Improvised motorised potters wheel was a result of the feed back received from one of the voluntary agencies. Some voluntary agencies have also helped in developing appropriate measures in stopping rain water seepage into houses from the chimneys of smokeless chullahs. It is very difficult to ensure that the benefits of development project reach the real needy, economically backward people. This problem has been solved by involving voluntary agencies working locally. GEDA has been able to deal with the socio economic and institutional aspect quite effectively by involving almost anyone who is countered with the development of people. Energy policy for planning is constantly changing, given the diversity of energy related

problems, diversity of solutions are called for. GEDA's endeavour will be to focus its attention on the future to come.

During 1991 GEDA has implemented one of the highest capacity wind based power plants. A 10 MW wind farm was inaugurated in the current year at Lamba in Junagadh district. In Energy Plantation 2500 Ha. Wastelands in District Kutch has been initiated. The state of Gujarat continues to maintain the lead over other states in popularisation of solar thermal systems. During the year 1989- 90 GEDA installed 213 large capacity solar water heating system with an installed capacity of 3,555, 400 lts. per day and 1000 domestic solar water heating systems with an installed capacity of 1.62, 100 ltrs. per day. These accounts for 25% of large capacity and 70% of domestic capacity systems installed in the country, these systems are expected to save approximately 0.55 crores unit of electricity for 0.08 crore liters. of furnace oil or equivalent of 5175 tonnes of fire wood annualy. In the field of energy conservation, 5,000 agricultural pump sets were rectified in the year 1989-90. These measures will result in saving of 0.04 crores litres. of diesel and 0.33 crores KWH of electricity.

The work of popularising improved chullahs have been continued in collaboration with voluntary agencies. During the year 1989-90, GEDA has implemented 63,034 improved chullahs making 109 villages smoke free. This programme has created a big potential for self employed workers. GEDA as a policy decision, trains local youths to operate, maintain and provide feed back on our systems installed. This has contributed substantially to employment generation in the rural areas.

Energy Use in Agriculture : Efficacy and Sustainability

by

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Energy and Agriculture

Traditionally agriculture has depended more on free energy subsidy than any other sectors of modern economy and its share in national energy consumption has been quite low. In spite of technology generation and adaptation, effective energy consumption by that sector remains at around 6 percent in both the developed and the developing countries with slight variations. But if the food sector is considered, energy consumption by the developed countries soars up to over 16-17 percent of total energy consumption, the developing countries showing a share of something between 8 to 12 percent. This is obvious from the fact that food processing and processing technology are either under-developed or that the food habits are slow changing. For example, in the United States, food system consumed about 17 percent of nation's energy, processing and distribution accounting for about 85 percent of that. Crop production consumed only about 2.5 percent of total energy.[1]

In the developing countries like India, energy consumption by agriculture has been increasing at a faster rate owing to modernisation tendency. Its share increased from one percent in 1953-54 to 2 percent in the sixties, 3 percent in the seventies and over 6 percent in the eighties[2] The introduction of seed- fertilizer technology coupled with increased electricity consumption for irrigation and tractorisation resulted in the marked increase recently. Moreover, the policy to produce more without recourse to social and environmental effects speeded up the consumption of commercial sources of energy with little development of non-commercial sources which have sustained crop production since long. It is estimated that food system as a whole consumes around 10 percent of energy

consumption. A sad trend is that the estimated energy consumption by the agricultural sector in the year 2000 AD will linger around 6 percent.[3] Except a marked increase in electricity consumption, increase in oil, coal and other commercial sources would not be substantial. That gives the non-commercial sources a prime role to play in sustaining adequate energy for agriculture for a long time to come.

Agriculture is both energy-producing and energy consuming, the former aspect assuming a greater role due to free energy subsidy obtained through solar radiation, soil, rainfall, temperature and the specific agro-climate. Crop and animal production in terms of alimentary calories would outweigh the inputs in energetic terms directly and indirectly. If direct energy is imputed it could be in the nature of seeds, manures and chemicals, machinery, oil and electricity consumption, human and animal labour input and so on. If indirect energy is to be accounted, energy expended in seed, fertilizer, chemicals, machinery and other inputs manufacturing is to be considered. Also, when energy for processing and distribution is included, the system would envelope a greater degree of energy equivalence.

Indian agriculture has traditionally depended upon non-commercial sources of energy including biological, for sustenance. According to a study,[4] 77 percent of energy consumed by agriculture in 1971 was shared by bullock and human labour and commercial energy like fertilizers, electricity, etc contributing for the rest. During the eighties, the share of commercial sources of energy used by agriculture increased substantially but still the contribution of non-commercial sources was significant, though declining over years. Of the total commercial fuels, agriculture consumed only 2.9 percent[5] the remaining 3 percent contributed by non-commercial sources. According to a national survey, the contribution of commercial energy would go upto over two thirds by the end of the century.[6] Still agriculture would be left with a low energy intensity when compared to other sectors. Interfarm, the variations would largely depend on the nature of irrigation, quality of seed, usage of synthetic fertilisers and energy intensive plant protection chemicals. It may be pointed out here that the initial pace of increased fertilizer consumption witnessed during the early eighties has greatly subsided especially in years of unfavourable monsoon. It has been estimated that fertilizer consumption by the close of the century would be only at the 1980 world level and this also depends on the import capacity and other factors. A decline in the contribution of human and animal labour and a substantial increase in the contribution of irrigation pumpsets and agricultural machinery was foreseen[7] but it is doubtful whether the targets especially in respect of machinery could be achieved. There has been a tremendous increase in the installations of pumpsets which has necessitated an increased share in electricity consumption. Ineffective irrigation, low level of chemical consumption and other factors would compel productivity gains not to be attractive. This goes to prove that unless crop production becomes modernised with increased energy intensity, substantial increase in productivity would not be achieved. When the scope of commercial

energy is limited to agriculture, the attention naturally moves toward renewables to sustain the pace of agricultural growth.

The Role Renewables In Agriculture

Unlike the fossils which have limited but direct use as fuels, renewables have multiple uses and can be used indirectly or with low thermal efficiency only. Conversion would ofcourse demand higher energy intensity and technology best suited to the purpose. There are successful cases of solar and hydro power being utilised in different levels and types. Agriculture predominantly ruralised, performs well under conditions of full integration of different renewables and also commercial fuels in the rural system. Attempts to integrate the use of biogas, improved cookstoves and social forestry so that a larger share of renewables is made available to production have also been made with adaptations from other models. Since different sectors in the rural system are interconnected, energy use in one affects the other in so much so energy efficiency can be achieved only if it is throughout the sectors. The very fact that non-commercials dominate the rural system alludes that all the rural sectors suffer from inadequate and inefficiency in one sector will automatically lead to better effectiveness in the other. In this regard, it would be agriculture rather than the domestic sector which has to show the way.

Agriculture being both energy producing and consuming, it can consume a part of its production as in the case of organic compounds. Fertilizers and better quality seeds, along with labour-saving quick intensity methods would demand external and higher energy intensity. Crop and animal residues can be used as fuel, manure or for other purposes. If these show increased production, the fuel problem of the domestic sector could be contained to a large measure, for firewood, the fast depleting resource has to be substituted by other renewables or commercials for a long-term development process. Several estimates have been made as to the proportion of crop and animal residues that can be used as fuel or fodder.[8] Their availability can be increased through a complete shift to modern agriculture, meaning not only a fusion between modern and traditional methods of production and processing but also a sustainability without endangering the existing population of species, environment and the like. Given the limitations of energy intensity how best an energy shift would yield an optimal net energy productivity and biomass production. What structural changes have to take place for a better mix of foodgrain and cash crops, export crops and products, agroindustrial and energy plantations. Again, how the negative impact of residue burning, use of cattle dung, pesticides, fertilisers and other effluents in the system could be minimised. These and several other questions will bother for a long time to come. The dilemma is that if commercial energy intensity is not increased substantially, agriculture will suffer but a slowing down of the intensity would aggravate the crisis even more. Without realising a higher intensity as the developed countries, the developing countries seem to face the

negative problems of the former in such a short span of time.

Energy use in Micro-system

Energetics has little significance in agriculture owing to more than 99 percent of energy coming from the effects of solar energy. Yet to the extent the commercial sources of energy are being used and to the extent the renewables become scarce, the analysis would throw light on the importance of different inputs, differing levels of energy intensity and the relative sustaining capacity of the inputs. With this view, energy equivalence was attributed to different inputs based on their alimentary callorie value as in the case of seeds, energy (direct and indirect) in the organic and synthetic nutrients or actual consumption as in the case of electricity and other inputs. The study relates to some 175 households spread over the Udupi block of Dakshina Kannada district of Karnataka during 1988-89. An attempt was made to find out the energy intensity across different farms and energy efficiency in terms of a ration. Udupi is a heavy rainfall region with over 35 percent of irrigation and having about 33 per cent of net sown area under cultivation at a crop intensity of 1.4. Being a coastal taluk, fishing is an important activity besides agriculture. The taluk assumes importance owing to the launching of the integrated rural energy programme. The objective was to find out how far the programme has enabled improvement of the energy situation in domestic sector. Indirectly, that should also enable a better agricultural base which would benefit from such an integration. In the taluk high yield paddy (60% of the paddy area), cashewnut and coconut are the main crops. Most of the farmers would be having some paddy land, some coconut trees, chashewnut trees besides other crops.

Table 1 highlights the energy consumption pattern across different farmer g roups for all the crops combined. The energy intensity has been expressed in terms of joules. Energy productivity in terms of the ration of output energy to input energy has been worked out for comparision.9 It may be pointed out that the region is not an energy intensive area like Mandya and offers a moderate level. Among the different categories of farmers little difference is noticed, but it is the different levels of input energy that is striking. Seeds on an average share 3.6 percent of energy intensity, marginal farmers having a slightly higher proportion. The share of organic manure is 10.5 percent, the medium, small and marginal farmers having a higher share. It is the chemical input consisting of synthetic fertilisers, micro-nutrients, artificial soil amendments and plant protection chemicals that has the highest share in the consumption level ranging from 31.8 percent in the case of medium farmers to 35 percent in the case of artisans, service and business households and labour units. Next important input is labour, a combination of both human and animal labour. In the region, buffalo ploughing is most common and crops like arecanut are very labour intensive. The average share is 20.2 percent, showing variation from 18.5 percent in others to 21.8 percent in small farmers.

Irrigation accounts for 8.1 percent of energy, the share being higher for the big farmers. Irrigation in the region is resorted only in the non-monsoon period and the intensity varies according to the crop intensity. Though in value terms the share would be quite less, in energy terms the tendency shows one of increase. Other inputs like tractors and power tillers, supervision, transport and storage and home processing consume considerable amount of energy ranging from 20.3 percent in the case of marginal farmers to 25.9 percent in the case of medium farmers.

Total energy consumption per hectare works out to 13.6 gigajoules. The per ha intensity is higher in the case of marginal farmers with a total of 14.5 GJ and the others group has the lowest intensity of 11.3 GJ. The big and medium farmers have a relatively lower energy intensity than the small and marginal farmers. Paddy was the major crop raised followed by coconut, arecanut and other crops. In energy intensity, paddy leads other crops especially in the case of manure and fertiliser consumption, irrigation, etc.

The energy ratio expressed in terms of input and output energy shows that the medium and small farmers register a ratio of 2.4 net (main production) and 4.5 gross (including byproducts), followed by the big farmers. The marginal farmers and others register a lower ration. Energy analysis of this sort has little meaning unless compared with the economics and regional suitability of the production base over years. Risk factor may demand a shift to less problematic crops like coconut or arecanut than paddy in which case neither economics nor energy would hold the sway.

Conversion of inputs and outputs into common energy measure has its own problems and different methodological criteria are being adopted to measure different fuels and inputs. Direct and indirect energy consumption consideration influences much in this.[10]

Efficacy and Sustainability

A lot of controversy as regards the sustainability of developed as well as less developed agricultural system is being generated and the movement toward organic, bio-dynamic and sustainable agriculture mooted out in both the systems. When the ills of chemical technology was discovered on the system equilibrium and on the environment, lowering of the technology intensity, going back to traditional type cultivation system (where the energy ratio is the highest), reduction of livestock production which consumes higher energy than crop synthetic fertilisers and plant protection chemicals that are dangerous to living organisms, etc have been advocated and adopted. The rate of adoption of the so- called more sustainable agricultural system may not be even one percent, but the movement is gaining ground. Perhaps, the ills of modern agriculture are not severe as those of industry, transport or thermo-nuclear energy.

Energy mixes which can sustain the growth of agriculture and at the same time be efficient have been tried under several agro- climates. For example, the concept of sustainable agriculture reconciles with inorganic agriculture concept partly in that, since complete avoidance of chemicals

TABLE 1

Groupwise Energy Consumption in a micro-region (1988-89)

Farmer Group	Land area (ha)	% of irrigated	Seeds %	Manure %	Chemicals %	Labour %	Irrigation %	Others %	Total (GJ/ha)	NetER (Ratio)	Gross ER
Big Farmer	6.10	51.0	3.5	8.2	33.8	19.5	10.6	24.4	12.6	2.33	4.33
Medium Farmer	2.95	48.5	3.2	10.2	31.8	21.0	7.9	25.9	13.4	2.41	4.45
Small Farmer	1.31	57.5	3.7	11.8	33.5	21.8	8.7	20.5	14.0	2.40	4.51
Marginal Farmer	0.63	60.0	4.0	12.5	34.5	20.7	8.0	20.3	14.5	2.06	4.00
Others	0.21	50.0	2.8	6.5	35.0	18.5	9.5	27.7	11.3	2.21	4.11
Average	1.62	55.0	3.6	10.5	33.3	20.2	8.1	24.3	13.6	2.34	4.32

Notes: GJ = 10^9 joules; Energy Ratio (ER)= main (net) or gross output energy + input energy;

Energy equivalence @ MJ/kg : Seeds 14.6, manure nutrients 28.6, combined fertiliser nutrients and plant protection chemicals 32.8; human labour 6.6/day, animal labour 21/day, irrigation 2.2/cu.m (@ 50% share by IP sets for total irrigation) and machinery according to break-power.

Seeds include combination of different crops; other inputs include machinery, supervision, home processing, transport, storage and miscellany.

Total sample size was 175, distributed as 10, 40, 50, 55 and 20 as per the above groups. The micro-region refers to Udupi block of Dakshina Kannada district of Karnataka. Apart from the 4 farmer groups, others include labourers, artisans and service households.

may aggravate the pests and diseases problems and that without synthetic fertilisers, organic amendments would be very costly and highly impossible. Hence chemicals have to be applied for obvious reasons. Only in a total non-chemical system that complete biological agriculture will have meaning just achieving self-sufficiency and nothing more.

Increased energy intensity under Indian conditions has to safeguard not only increase in productivity but also in employment, equity, environment stability and other conflicting objectives. It may be that all the objectives may not to be achieved all at once but depending upon the priority of the objective. The major thing to be visualised is that the depleting energy sources are conserved focussing on the renewables. This issue will be debated until the time the renewables become competitive and efficient.

Sustainability can be achieved by integrating the different energy sources in

the rural system as such, by devising proper measures as to quick-yielding vs long-enduring processes of conversion, by diversyfying the rural system to lay greater emphasis on cash crops, export crops, improvement of agro-industries and by selective policies aimed at development of both commercial and non-commercial sources of energy.

Among different types of energy, development of biogas and integrating it with livestock, cookstove and forestry resources would pave way for increased release of residues for crop production and better quality energy in manures and household fuels. Electricity ofcourse has to be made available in a larger quantum to the agricultural sector so that the pace of irrigation development is speeded up. Renewables no doubt can plan an important role but whether agriculture can hope to depend upon them fully is open to question. Renewables are not energy sources per se and the hope should lay on perhaps utilising the abundant solar energy and ocean energy. In the region of the sample study, tendency was noticed that the integration process would take its own time and the problem of efficiency and stability may not assume due importance as they are not the immediate basic needs.

Notes

1. RP Poincelot. **Towards more Sustainable Agriculture,** Avi publishing co, Connecticut, 1986, p.34
2. As calculated from the Report of the working group on Energy Policy, Planning Commission, New Delhi, 1979
3. As calculated from Energy Requirement in 2004-5, Advisory Board on Energy, New Delhi, 1984
4. R Ravelle, 'Energy Use in Rural India' **Science,** 1976, pp969-75
5. Tata Energy Research Institute. 'Tata Energy Data Directory and Yearbook', New Delhi, 1988, pp 14-27
6. As per the estimates of Working Group on Energy Policy, New Delhi, 1979
7. Report of the National Commission on Agriculture, 1976, vol X, chap 50
8. D Lahiri and R N Chattopadhyay, 'Rural Energy-Agricultural Interactions: Case Study of West Bengal State', Rural Development Centre, IIT, Kharagpur, 1991 cite ranges from 25 to 35% of crop residues and animal dung as use for fuel.

9. For issues regarding energetics, see C R W Spedding and J M Walsingham. 'The Production and Use of Energy in Agriculture', **Journal of Agricultural Economics,** 1976, vol.27 no 1, pp 19-30

10. For methodological issues and comparative energy consumption data in agriculture, see T K Molik et al. 'Energy Demand Forecast for Agriculture in India', **Economic and Politictal Weekly,** December 29, 1990, pp.A-165-75

Some Problems in the Implementation of Strategies for Managing Energy Demand in the Rural sector

by

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Summary

Energy, in different forms, is a pre-requisite, not only for basic minimum needs, but also for economic development, of our rural and remote populations. A large proportion of these population is very poor and cannot afford to buy commercial fuels. The decentralised energy systems offer possibly the only means of providing an opportunity for them to participate in the national development processes. At current levels of development, renewable sources of energy may play only a limited role in the global scene, but their importance at the local level should not be under-estimated. The objectives of investing in the development of improved renewable energy technologies are manifold, and a wide range of technological options is available for exploitation of renewable energy sources; the economic viability, in many cases, however, has not been established yet.

The indigenous R and D needs are principally dictated by two factors: the gaps observed in the levels of technology development and utilization in the national and international scene; and the relevance and priorities taking into account our context and needs.

The area of DES is extremely vast, and has the potential of improving directly the living standards of rural or isolated populations. Since the choice of systems is also wide, unless efforts and resources are focussed, the plans will not yield the desired results.

The agencies for planning, implementation and monitoring the DES programmes are identified, and some recommendations covering both technological and economic factors are offered for effective implementation of the strategies for managing energy demand, particularly in the rural sector.

1. The Role of Energy in the Rural Sector

The majority of our population lives in rural areas, with at least 25% living in small remote villages. Energy, in different forms, is a pre-requisite, not only for basic minimum needs, but also for economic development. The prospects for improved living conditions, leading to a better quality of life, depend to a large extent on the availability and exploitation of energy resources. The contribution of energy availability would be to raise the standard of living, and to generate employment by providing basic energy requirements for agriculture, local industry and for domestic purposes.

Rural energy needs are primary for domestic purposes, such as cooking, lighting and heating; motive power for agriculture and light industry; transportation; construction; services; and communications. At present, approximately 90% of the rural energy supply comes from non-commercial energy resources, such as firewood, charcoal, animal dung cake and crop residues. A large proportion of the rural population is very poor and cannot afford to buy commercial fuels, such as coal/coke, kerosene, LPG or electricity. In spite of committed efforts by the Government for rural electrification, extending the grid to remote and isolated villages is extremely cost-ineffective because of the enormous transmission and distribution losses.

2. Decentralised Energy Systems as a Strategy for fulfilling Rural Energy Needs

Under the circumstances discussed in the earlier section, decentralised energy offer possibly the only means of providing an opportunity to the rural populations to participate in the national development processes. Decentralised Energy Systems (DES) may be considered to refer to the fulfillment of at least some of the energy needs (of essentially isolated and remote populations) by means of locally available energy resources.

Their effectiveness can be maximized by suitably matching the quantity and quality of the energy needs with an optimal mix of available energy resources.

In principle, DES may include non-renewable energy systems leading to, for example, captive power generation, independent of grid power, but by and large, they involve renewable energy sources. In the context of energy for rural development, these are the principal focus of attention. Among these, in the case of flux type of resources, the concern is for efficient utilization, whereas in the case of 'stock' or 'capital' or 'material' type of resources, such as biomass, biogas etc. the problems of cultivation or production and of utilisation have to be tackled.

3. Technological Options for Exploitation of Renewable Energy sources

At the present levels of development, renewable sources of energy may play only a limited role in the global scene, but their importance at the local level should not be under-estimated. The objectives of investing in the development of improved energy technologies for the cultivation and utilisation of renewable energy resources are :

- to manage these resources more efficiently
- to increase the energy base, for overall increase in productivity in different sectors of economic development
- to minimise environmental degradation
- to reduce drudgery and human labour
- to extend the finite supplies of non-renewable energy resources.

Quantitative prediction of demand for different types of renewable energy equipment is extremely difficult in view of the fact that they are intended primarily to satisfy the needs in the unorganised non-commercial sector. Extrapolation of per capita electricity or non-renewable fuel consumption figures would be unrealistic. Furthermore, the economic and even technical viability of many of the DES are yet to be unequivocally established, and the production volumes would be dictated by the success achieved in field use and the subsidy policies. It is necessary to encourage private enterprise through suitable schemes for propagating successful devices.

4. Classification of Renewable Energy Sources suitable for Exploitation as DES

4.1 Solar Energy

Solar Energy is by far the most abundantly available renewable energy resource.

*** Solar Thermal Energy**

While the technology for the use of solar energy in space heating and water heating is sufficiently well-developed for application on a large scale, it has not achieved economic viability or convenience in use.

*** Solar Photovoltaics**

Direct conversion of solar energy to electricity by means of photovoltaic devices has the following characteristics: high reliability, low maintenance requirements, no fuel costs, modularity, intermittent output without storage, and continuous output with storage. The disadvantages are the low conversion efficiency and the inability to use (electrical) storage.

Electricity is not only one of the most versatile forms of energy, but also unsubstitutable for some applications, such as TV, radio, telephones, etc. The availability of electricity in the rural areas can bring about significant improvements in medical facilities, communications, education, etc.

*** Solar Passive Architecture**

Passive systems exploit the orientation, design and constituent

components of the building so that the energy collected by the building is distributed by natural draught and fans for maximum thermal comfort. This design strategy can be very cost-effective and environmentally beneficial.

* Biogas

There is a wide range of organic material with potential for biogas generation: drop wastes (such as weeds, straw), wastes of animal origin (such as cow-dung, poultry litter, fishery wastes, wool wastes), wastes of human origin, by-products and wastes from agriculture-based industries (such as twigs, bark, branches, leaves) and wastes from aquatic growth (such as water hyacinths, marine algae, seaweeds). The potential use of biogas in the domestic sector is for cooking, lighting, hot-water heating and space heating. Additionally, it can also be used in gas-burning appliances, internal combustion engines, water pumping and generation of electricity. The residue of undigested materials leaving the biogas plant is an excellent fertilizer. The latrine- based biogas plants contribute to the improvement of sanitation.

* Biomass

The term biomass includes all organic material obtained either directly or indirectly from the growth of plants, and encompasses a wide range of materials, such as wood, coppice, agricultural residues, and including human and animal wastes. Under the UN terminology, in addition to agro and forestry residues, biomass includes municipal solid wastes (MSW). Presently biomass provides multiple uses ranging from food, fodder and fibre to fuel. When considering biomass as a source of energy, two uses should be distinguished: the use of vegetable matter (trees, plants, algae etc.) directly, or as an energy crop; and the use of refuse from earlier use of such matter (animal droppings and industry etc.).

The basis for all of these is the solar radiation through photosynthesis. The annual primary photosynthetic production of world's forests is over 50 x 1012 W, which is approximately 10 times the total annual present production of oil and natural gas.

One of the principal routes of utilisation of biomass for DES employs biomass, in gaseous or liquid form, in prime movers, such as spark ignition, compression ignition, or steam engines. Gasification of biomass is an essential intermediate step in these processes. Conversion of biomass into combustible gas is effected either through bio-degradation processes or thermochemical processes. Biomass materials such as animal and human excreta are more amenable to the former, while wood, coppice and agricultural residues can be gasified thermochemically.

Biomass materials have inherent problems of collection and storage except for residues from agro- and

forestry-based industries and municipal solid wastes. Gasifiers and engines have problems of low efficiencies and environmental pollution. In all cases of biomass combustion, there is considerable dust problem; in addition, very often carcinogenic sludges and tars tend to be formed.

* Wind Power

Wind power is location-specific, and being a distributed resource available at the point of application, affords the possibility of providing remote villages with electrical/motive power without a distribution network. Wind power technologies are well-suited for water-pumping, mechanical power and electricity generation.

Windmill designs are basically of two types: vertical axis and horizontal axis. Both the conventional vertical axis machine have undergone intensive development over the past three decades. In wind power utilization, the larger the machine the more economical the performance; however, maximum sizes are limited by structural problems as well as by the non-uniformity of wind velocities over large areas. The size of windmills is also limited by the economic analysis for a specific site. Multi-vane machines produce high torque but low rpm, and hence are best suited for lifting tasks such as water pumping. Two- and three- vane machines produce high rpm and low torque, and are best suited for generating electricity. For every specific location and task, an optimum size and design exist. One of the commonly stated constraints to the successful introduction of wind power programmes in developing countries like ours is the lack of trained manpower to organize, plan and implement programmes for assessment of windpower magnitudes; to advise on silting, designing, selecting and installing hardware; and to collect and interpret field test data. Regional wind energy training centres are necessary for this purpose.

* Small-Scale Hydropower

This energy resource affords a viable option for supplying electric power to populations at significant distances from electric grids. Currently, a lot of attention is being paid to small installations of 100 KW or less. It is estimated that a 100 KW facility could be installed in a waterfall with a 6 m head and a flow of 1.5 m^3 per second. The cost of mini- and micro-hydel plants varies widely, depending on topography (slopes, storage evaporation), geology (dam location, run off) and stream flow (rainfall, drainage basin area).

The effective utilization of hydropower requires a site with adequate head and flow. For rivers where the flow is seasonal, dams must be built to permit flow regulation to meet demand. Where good hydro sites are available near load centres it is the least expensive source of energy available, but with increasing length of transmission lines the cost of power produced rises rapidly. While electricity has only marginal value for low-income

people who usually cannot afford it, small-scale hydro installations have the potential for meeting their basic needs.

The utilization of hydropower in developing countries is often thwarted by lack of hydrological, typographical, geological and economic data. Conventional microhydel power systems, suffer from the disadvantages of relatively higher cost, non-standard ratings, extensive ancillary civil construction, long executive times and the need for mechanical governors.

*** Energy from Municipal Waste**

There are at least two different strategies for deriving energy from urban (or municipal) waste :

(i) incineration, leading to steam generation; and

(ii) anaerobic digestion, leading to biogas generation.

*** Hydrogen Energy**

Another possible form of DES is through the production of hydrogen by thermochemical or electrolytic methods, storage in solid-phase, metal hydrides, and utilisation through H_2-O_2 fuel cells for operating electrical appliances.

*** Integrated DES**

Rural populations in developing countries like ours subsist with very low levels of energy consumption, most of which is in the form of non-commercial energy. Strategies to improve the level of energy availability and to ensure uninterrupted energy supply should emphasize the use of non-commercial fuels and adopt new technologies to maximize the benefits from renewable energy sources. The location-specific and intermittent nature of most renewable energy sources dictates the necessity for an energy-storage facility. The storage capacity can be minimized by employing DES comprising more than one type of source.

Most of the R and D efforts on the use of renewable energy sources to date have concentrated on the applicability of a single source, exploited either as a substitute for a conventional source or as an energy supplement to meet growing demands. An integrated approach combining the use of all locally available resources, including commercial ones, where available, will not only maximize the benefits obtainable from the renewable sources, but also ensure an uninterrupted supply of energy. Examples are combinations of solar and biogas energy systems, solar PV, and windmills or watermills, etc.

The feasibility of integration of different energy sources should be examined for the perspectives of increasing the conversion efficiencies, providing reliable energy supply, having the least adverse environmental impact, and enriching the quality of life in the existing socio-cultural context. It is ofcourse to be recognized that there are no universal solutions, and it is

necessary to employ an optimal mix of the available options and technologies for achieving maximum benefit to the local populations.

5. A Review of the Status of DES in India

5.1 Solar Energy

* Solar Thermal Energy

Solar thermal energy technology has been under development principally for the following devices: hot water systems, stills, cookers, hot air systems, thermal pumps, and intermittent or continuous refrigeration and air-conditioning systems.

The hot water systems fabricated and installed in India differ widely in workmanship and performance. Many users are dissatisfied with the systems, mainly because of poor workmanship, faulty installation and absence of guidlines for the users. In many instances, flat plate collectors are offered to yield hot water at upto 85°C, which is a poor design feature. In many instances, the installation of the systems has been faulty.

For ready acceptance of solar hot water systems for domestic use, appropriate design, trouble-free operation of the system with minimum maintenance, and clear operating instructions and guidlines to the user, must be offered and ensured.

The commonly available solar stills are rather carelessly fabricated. Scale deposition on the absorbing surfaces will result in reduced absorption of solar radiation and consequently low yields. With the presently available designs, frequent cleaning is cumbersome. If the user does not ensure a continuous supply of water, the still gets dry and promotes the formation of algae, which are difficult to remove. The addition of a black dye to the water to be distilled will enhance the absorption of solar radiation.

There are two principal types of solar cookers:

* Simple hot-box solar cooker, with a booster mirror

* concentrating type of cooker, with multi-booster plain mirrors, concave reflecting surface, or lens.

In our country, the hot-box type has been popularised because of its simplicity and ease of manufacture. The cooking pots, with covers, are generally made of an aluminium alloy or stainless steel, and are painted dull black on the outside for increasing the absorption or radiation.

The present models are meant for a family of upto 5 members, and for cooking only once during the day. The energy required for each cooking operation is equivalent to that required for heating two litres of water to the boiling point. The efficiency of a solar cooker is usually estimated in terms of the temperature history of water kept inside the pots for a couple of hours.

The materials and workmanship of most of the currently available solar

cookers are of low quality. The cooker is too bulky to carry, and cleaning the pots without scratching the paint is difficult. It is also not possible to fry foods with these cookers, e.g. preparation of chappattis.

Intermittent or continuous solar refrigeration and air- conditioning systems are still in the laboratory stage of development, as also solar thermal electric devices, employing either flat-plate collectors or concentrators.

*** Solar Photovoltaics**

At the national level, the solar PV activities intiated during the Sixth Plan have resulted in the development of indigenous technology for manufacture, installation and maintenance of PV systems, and have promoted awareness among the potential uses. The Seventh Plan envisaged a significant expansion of the programme, and the development of newer techniques of solar cell production, and the deployment of PV systems for meeting the rural energy needs. In addition, a high-priority S and T project in amorphous silicon solar cell development has been launched.

The objectives of the R and D programme are the development of low-cost solar cells, and improvements in efficiency, life and reliability of modules and systems. The potential of amorphous silicon for bringing down the cost of solar cells has been recognised, and projects on characterisation of the amorphous silicon films and solar cells, preparation of silane gas through different routes, including one starting from rice husk, study of deposition parameters and different conducting coatings for use as substiate material etc. have been initiated.

There are three Public Sector Undertakings and another 8 firms who are engaged in the manufacture and installation of PV systems. The current production capacity in the country is a few MW. Plans exist for the installation of PV-powered water purification plants, based on reverse osmosis and electrolysis techniques, and of 20-25 kwp power stations.

At present, the module efficiency achieved by Indian manufacturers is only about 9%, mainly because the indigenously available glass has poor transmissivity (of about 0.85 vis a vis 0.93 abroad), on account of high iron content. The major problem faced by Indian manufacturers is the non-availability of indigenous waters.

5.2 Biogas

The two most popular designs in many developing countries are the deep digesters with floating steel gas holders developed in India, and the fixed dome plants developed in China. Changes in digester design in India have been slow but continuing. The most persistent problems with the Indian type are those related to the floating steel gas holder. Due to large heat losses, this type is not very effective in areas with ambient water temperatures of 10 to 15°C.

Community biogas plants are disigned to provide cooking gas to a large number of families in a village. A few hundred community plants have been built in our country. About two-thirds of these are large versions of the typical Indian family biogas plants with floating steel gas holders. The present experience shows that the success of the community plants depends more on social rather than technical innovations.

Biogas plants are also important as a source of organic manure for farmers. The slurry from the biogas unit contains a full range of plant nutrients; digested slurry is better manure than farm yard manure.

5.3 Biomass

Some of the innovative technologies currently under development in our country are fluidised bed combustion/ gasification, which facilitates flexibility of biomass fuels, multi-fuel combustion, high burning rates, high combustion efficiency, and acceptance of low-grade and high-moisture fuels; and stirling engines, which are external combustion hot-air engines, capable of accepting a wide range of low-grade fuels, such as rice husk, saw dust, coir pith etc.

There are several models of improved cookstoves or chulhas under development and commercialization in the country; the materials of construction range from clay, brick, steel etc; and both fixed and portable models have been developed. A major breakthrough recently has been the development of three damper-less models, which afford convenience in operation and bring down cost. It has been found that efficiency and heat transfer are highly fuel- sensitive for cookstoves.

Clean fuel has also been prepared through partial pyrolysis of biomass, followed by briquetting using a binder. In this process, the volatile matter, including tar and other heavy liquids, are removed during the pyrolysis process.

5.4 Wind Power

Indigenous development activities have resulted in at least two new types of wind pumps and modifications/ improvements in the existing 12-PU-500 wind pumps. In addition, several horizontal - and vertical - axis windmills for water pumping applications have been field tested. Several proven windpower systems popular abroad have been identified and acquired for adaptation to local conditions and performance evaluation.

5.5 Small-Scale Hydropower

The small-hydro potential in our country is estimated at around 5000 MW, out of which about 3000 MW is expected in low head regions.

The Alternate Hydro-Energy Centre, set up by DNES at Roorkee, has completed indigenous design and development of hardware-civil,

mechanical and electrical - for low-cost micro-hydel applications. Currently, attention is being focussed on the development of velocity head turbine, variable-speed constant-frequency generator and microprocessor-based control system, and modification of pump as turbine, for micro-hydel applications.

5.6 Integrated DES

At the national level, the concept of Urjagrams which are the DNES programmes for decentralised integrated village-level rural energy projects, is being pursued recently. The Urjagram projects are based on the utilization of non-conventional energy sources, and are conceived in terms of a mix of energy sources to meet a major portion of the energy requirements in a village. The programme is aimed at evaluation of technical performance of individual devices, and systems, integration aspects, socio- economic viability, and the impact of the project on the process of overall rural development.

The Urjagram projects are designed on the basis of the survey of energy needs and resources, which takes into account the energy requirements not only for basic minimum needs, but also for agriculture, cottage industry and community facilities. The development of Urjagrams is a continuous process, having linkages with various other development schemes at the village level. So far, about 40 projects have been completed, and about 30 are in different stages of implementation.

6. Agencies for Planning, Implementation and Monitoring

The principal responsibility for the development and promotion of renewable sources of energy, at the national level, rests with the Department of Non-Conventional Energy Sources (DNES), established in 1982. Research and Development projects in this are undertaken by the IITs, Universities, CSIR and other research laboratories, KVIC etc. Manufacture of the commercial devices is taken up by both private and public sector industry. In addition, technology is imported from other countries, such as Denmark, for adaptation, absorption and upgradation.

7. Some Strategies for Implementation

The area of DES is extremely vast, and has the potential of improving directly the living standards of rural or isolated populations. Since the choice of systems is also wide, unless efforts and resources are focussed, the plans will not yield the desired results. In some areas, even indigenous experience is available, both positive and negativel but, the will to terminate non-productive efforts with little promise, and to strengthen programmes which offer reasonable promise of success, is not exercised in a timely fashion, in many cases.

Some strategies with technological and economic implications are listed below:

Low-temperature solar thermal device have intrinsically low

thermodynamic efficiency of conversion to mechanical or electrical power. Hence the objective of all low-temperature solar thermal programmes should be restricted to utilisation of these sources as thermal energy only.

From an economic analysis, the solar cooker is a good replacement for electrical cooking, or for cooking with non- renewable fuels. For the user, however, the purchase of a cooker is beneficial only when a subsidy is available; the subsidy is justified in the national context, if it avoids need for electric power, or for commitment of non-renewable fuels. From the point of view of convenience, the present designs leave a lot to be desired.

The subsidy policy must be dictated by the net energy savings (useful energy collected during the lifetime of the system minus the energy employed in the manufacture of the system), not only in terms of the quantities of energy, but also in terms of their quality. In addition, the monetary and energy costs of alternative ways of achieving the tasks must be taken into account.

An important aspect related to the propogation of the renewable energy equipment is market and user acceptability of the different devices. The translation of laboratory or even pilot plant processes and products to field use must follow a systematic procedure of competent engineering design and production practices.

In addition to the development of technology for renewable energy equipment, suitable downstream infrastructure must be developed for manufacture, delivery, maintenance, operator training etc.

Necessary policy changes must be introduced to permit private generation of electricity by small-scale hydropower.

A high priority should be accorded to the development of integrated energy systems. For this purpose, it would be necessary to make an assecessment of the energy demand and the resources (both conventional as well as non-conventional) in a region, and to arrive at an optimal mix of technologies for maximum effectiveness and minimum cost. This exercise should be conducted for the representative combinations of demand and resources, to serve as guidance to planners at district, block and village levels. The emphasis should shift from proving and propagating specific technologies to meeting the energy demands, employing a mix of

conventional and non-conventional resources in the most effective manner.

Wood-based fuels are an important resource for rural low-income population in developing countries. As wood resources become scarce for these populations, they burn dung and crop residues which are essential for maintaining soil fertility. This problem can only be tackled through efficient utilisation of biomass and establishment of new biomass reserves. The former involves the development of efficient cookstoves to replace open fires, and the efficient production and utilisation of charcoal.

For easy acceptability and effective functioning of the DES, the users must be involved in the design and development of the devices.

Socio Economic Aspects of Implementation Emerging Technologies Such as Improved Chulhas, Solar Cookers and Biogas

by

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Cooking is performed ever since humans learned to build fire and convert raw items into cooked foods to increase the variety of foods they could consume. The technology for burning fuel to cook food (hearth) in rural areas underwent little change though the fuel and cooking units in urban kitchens changed with times. The government initiated energy intervention technologies like biogas for rural women to shift from conventional open hearth or shielded chulhas to modern renewable energy technologies. The cooking energy needs of the rural households are met mostly from biomass which is basically a non commercial commodity. The share of non commercial energy forms in the national estimations may reveal a drop in proportions though its share in absolute terms have increased. This trend is going to remain the same for years to come and hence non commercial fuels will continue to play an important role in India. There is a dearth of authentic information on the demands on non commercial energy forms due to the complexity in collecting data over various periods of the year. However it is observed that nearly 90 per cent of rural households, 75 per cent of semiurban households and 25 per cent of urban households depend on firewood stoves (Gupta et.al.1983). According to Planning Commission (1982) estimates the fuel-wood demand was about 133 million tonnes which shows a shortfall of 94 million tonnes. The population in India is likely to touch 1 billion by 2000 AD and the fuel-wood consumption is expected to be 250 million tonnes against 170 million tonnes of 1980's (Shyam and Nagaica 1981).

Cooking an Essential end use of Energy: Urban/Rural Scene

There is a disparity in the energy consumption in rural and urban sectors. Commercial and electric energy used per capita is nearly 20 and 28 times greater in urban sector than in rural areas. Though 56.1 per cent of the villages are electrified, it is beyond the purchasing capacity of majority in rural areas and hence is not an energy source for nearly most of the rural households. The fuel consumption for lighting and cooking in urban and rural areas shows that 84 per cent of lighting is met through kerosene while 94.5 per cent of cooking needs through non commercial sources in rural areas, while in urban sector 53 per cent of lighting from electricity, 45.2 per cent from kerosene and for cooking 85.1 per cent through non commercial and 26.5 per cent through kerosene and the rest from commercial cooking gas. The number of households in rural sector is 100.9 million against 32.1 million in urban sector. In other words for 80 per cent of the population more than 56 per cent of energy is met by biomass. (ABE, 1985).

Fossil fuels being inadequate and costly due to heavy transportation charges, cannot be reached to every nook and corner of the rural areas to meet the need of food, shelter, health, sanitation, hygiene, agriculture and industry. The per capita energy consumption of rural India is one of the lowest in the world and it is limited to satisfy the basic necessity of food. The cooking energy need is the most prominent energy need in rural India which accounts for anything between 70 to 90 per cent of total energy demand. This energy need is met by fuel wood gathered and purchased, animal dung and agrowastes and these are burned in traditional cookstoves with abysmal thermal efficiencies leading to untold health hazards.

In the poverty stricken areas of the Indian subcontinent, fuel gathered meets not only domestic energy needs but also is used to earn a living through the sale of excess. Biogas technology has led people to conserve dung for biogas units thereby affecting wayside collection of free dung. The poor with little resources at their disposal are left with no choice but purchase fuel. Then the question here is whether they can afford it or not? As fuel crisis worsens they would be forced to reallocate part of the resources spent on food, to meet fuel costs thereby affecting their already poor and imbalanced food intake. Non availability of fuels, and restrictions imposed on fuel gathering can foster antisocial behaviours like stealing, illegal felling of trees, encrochment of forests, and corruption amongst controlling officials which can adversely affect development process.

We are moving into an era where there will probably be adequate food supply to feed the growing millions - thanks to the green revolution - but without enough fuel to cook food. The shortage is so acute that we are heading to probably another more alarming energy crisis. It is therefore necessary to relate energy crisis to quality of life and development rather than to fuel shortage.

Biomass : An Irreplaceable Cooking Fuel

Biomass is a renewable from of energy which is a sink for CO2 and helps to

conserve soil and water, prevents soil erosion, curbs surface run off and reduce receeding forests. When biomass is used as fuel the gap between supply and demand widens leading to many ecological imbalances. Advisory Board on Energy to Government of India has estimated that the demand is going to increase from 120-130 Mt. today to 375.5 Mt. by the turn of the century, if biogas is also produced from dung. The fuel food needs are met partially from forest lands and partially from freelands.

Regeneration is slow due to repeated destruction of natural system by man and also due to drought. The present regeneration capacity of the forests in India is 32 million tonnes and about 20 million tonnes of fuel wood is available from waysides and private lands. Social forestry projects supply another 12 million tonnes. Thus the total availability of fuel wood per annum is 64 million tonnes against estimated demand of 140 million tonnes. (Mahajan, 1990). Fuelwood (biomass) is the main cooking fuel to almost all the households using biomass burning stoves. It would continue to be so for many years to come.

Alternatives to using wood for packaging, paper manufacture, railway sleepers, construction, furniture and the like are needed to reduce pressure on timber in forests. Grazing too reduces vegetal cover. Sawdust and other waste fuels as well as low dense fuels need briquetting to improve its burning efficiency. Generation of producer gas is also an appropriate alternative to tackle shortage of fuel wood through thermo-chemical reaction.

Agrowastes

Agrowastes may be used as fuel, fodder, fertiliser, building material and as raw material for industrial activities. It is estimated that about 100 million tonnes of agrowastes per year is available as fuel (NPC 1984-86). If the agrowastes are left in the fields it would add to the fertility of the soil.

Animal Dung

The livestock population of the country has been estimated at 260 million. The annual availability of dung is of the order of 1100 million tonnes @ 4.2 tonnes/cattle/annum. Assuming 75% collection out of which 33% is available for fuel, will yield 275 million tonnes of wet dung. This is equivalent to 55 million tonnes of dry dung per annum (Mahajan, 1990)

Women and Energy Crisis

It is needless to mention that women play a pivotal role in almost every economic and development activity. Nearly half the productive human resource of the country comprises of women. Women in rural areas work as hard as their men (if not harder). Much of their work in life supporting activities, which are crucial and essential for existence and survival of man, households and community at large go unnoticed and unappreciated. Fuel, fodder and water collection absorb a major part of such work time of women. A lot of productive time and energy are spent in attending to daily chores. They suffer heavy opportunity cost (George, 1989).

Rural woman is entangled between two processes - one increasing scarcity of fuel forms and second increasing concern about protecting the environment and conservation of natural resources which limit the availability of free resources. The multiple roles she assumes are burdensome. Her personal problems are relegated to the background. The poor rural women - pregnant, old, young, disabled, working or non working - have the awesome responsibility of meeting crucial household needs like that of fuel gathering and cooking day after weary day. The fuel shortage hits the women and children the most.

Poverty compels women and children to depend on what is available free of cost. Due to denudation of forests and increasing scarcity, such free fuels are becoming increasingly scarce. The policy of government on forest conservation also has ironically led to increasing drudgery of women. Women from households are required to make more frequent long trips to gather fuel which lead many a time to decline in the quantity of fuel gathered. Additional need for fuel storage space can put a constraint on space available for family living.

Due to increased effort, less fuel and less cooking, the health of women who get the last morsels deteriorate. Time spent in economic or productive work declines causing a drop in real and/or money income. Women are forced to make uneconomical use of agrowastes and dung by burning it under the cooking pot reducing fertility of land leading to a gradual drop in productivity. Cooking at open hearth or traditional chulha itself is a hazardous and cumbersome task to which a woman is exposed to from a very tender age of 10 to 12 years. Basically she accepts this without exploring the scope for improving her work environment and resigns hereself to fate (George R., and Vangle, V.)

At present in most rural kitchens biomass is burnt in conditions that lead to low efficiency emitting pollutants that are detrimental to human system. But our rural women are blissfully unaware of the poisonous gases to which they are exposed while cooking at traditional chulhas. WHO in 1984 reported respiratory diseases as a primary cause of death in developing countries. The incidence of chronic obstructive lung diseases (COLD) among rural adults in Nepal is shown to be associated with exposure to smoke from chulhas. Acquired respiratory infection (ARI) is a major cause of high mortality rate of children in developing countries (Smith, 1985). The presence of chronically ill adults is an economic liability on the family which is already in the grip of abject poverty. A means to reduce human and economic burden is to introduce measures to reduce smoke exposures. The emerging cooking technologies are appropriate in this regard.

Renewable Energy Technology Option: Improved Chulha (Cookstoves)

Improved cookstoves (ICs) have thermal efficiencies well above 20 per cent and if prudently used, save about 40 per cent of conventional fuel with the minimum saving being 20 per cent or a little more in adverse conditions of operations in the

field. The average annual saving in biomass may be between 219 to 440 thousands tonnes in the worst to best conditions of operation from about 5,00,000 ICs.

The IC technology is very close to traditional chulhas requiring no drastic change in cooking habits and meal timings but requires prudent fuel, cooking and chulha management on the part of its users. The resultant benefits are remarkable in terms of fuel saving, drudgery relief and health added to time saved in accomplishing tasks related to cooking fuel cycle. The pottery liners/ceramic liners add to the efficiency of the chulha as well as its life. Any layman can fix it into the platform and mud or brick after observing once thereby making refitting it into new platforms as of when needed an easy task. Any conventional fuel can be burnt in IC with better thermal efficiency values. Use of grate in the firebox depends on the fuel burnt.

Solar Cookers

Solar Cooker (SCs), on the other hand, is a renewable energy technology very different from conventional stove and fuels. It calls for changes in cooking habits and meal timings. This device is not a total replacement to conventional chulha for cooking though it is an ideal technology for stewing, boiling, baking, steaming but not frying. It requires minimal input from the cook (Women) in attending to cooking and one can dovetail safely another active task alongwith solar cooking while it is not so possible with IC or biogas unit. For example one can load cooker and go for shopping or to office. The cook (woman) needs to exercise preplanning to prepare items together to load 2 to 3 items simultaneously in the SC and also should learn how to operate it and attend to minor repairs and maintenance. An area safe and easily accessible close to conventional kitchen where unobstructed sunrays can fall on to the SC facing southern hemisphere is an essential prerequisite to its use. Solar cooking is slow cooking, nutritious cooking and safe cooking which can conserve 70 to 80 per cent of conventional fuels in cooking with sauting and cent per cent in cooking without sauting i.e., in baking, boiling, stewing and steaming (George, R., 1990). India is blessed with intense solar radiation in plenty during most of the year. Solar cooking is cooking outside in the open which is practised by most rural households with traditional stoves during most of the year due to illventilated and ill-lighted kitchens. If the household so desires, it can have its cooking done near the field where it labours, if it has a safe storage for SC near its place of use. The daily raw food items need to be carried to the site of work where SC is to be put up for cooking. A change indeed from traditional way but a change for the better.

Solar energy, as we all know, is renewable; non polluting, plentiful, (no cost presently), ensures cooking without smoke and tears, no soot deposit on vessels, no scortching or burning of food, no hassles with cleaning vessels and fuel procurement. What more women need to get relief from laborious cooking responsibility to enable them to participate in development process and weave a better morrow for themselves and their daughters. The transition has to occur. The will and determination have to come from

themselves and not from external forces. They should decide their lives, their future and their involvement as partners in economic growth and development.

For a country like India solar energy can be one of the most important alternative energy to meet cooking energy needs. It can play a vital role as a decentralised energy source in remote areas especially where commercial energy may reach after many many years.

Solar cooking is an attractive option as it is ecologically, environmentally, economically and socially sound. Though SCs do not offer a panacea for energy crisis it definitely has the potential to conserve conventional fuels and buy the time needed to develop appropriate alternate energy for cooking. However SC is not a technology for each and every household. It would satisfy only a selective group. SCs are yet to find popular acceptance. The problems associated with it are psycho-socio-cultural in nature though a few technology related issues (technical problems) may also be observed. Some problems are related to absence of local infrastructure for repair and cooking cannot wait until things are set straight. Orienting users in the right perspective with reference to it can do wonders to its successful transfer.

Biogas Stoves

Biogas from animal dung is an attractive option in places where dung and water are available as it is environmentally sound. The annual production of 22425 million m^3 of gas from dung would replace 13904 million litres of liquid fuel per year. The slurry obtained would be 206 million tonnes of organic manure which would replace 1.4 m.t. of Nitrogen (N_2), 0.9 m.t. of Potash (K_2O) and 1.3 m.t. of Phosphate (P_2O_5). The soil composition and soil fertility would improve leading to better agriculture yield. It is estimated that '50 thousand biogas plants would save 600 thousand tonnes of wood equivalent per year, i.e., a return of Rs.500 million per year (DNES, 1981). In India out of 140 million households about 16-22 million can meet cooking energy needs through biogas (ABE, 1985).

The cookstove - biogas stove - is a variation from cooking gas (LPG or natural gas) stove used in urban kitchens and by the well off in rural kitchens. Biogas is clean, fast, less polluting but requires considerable input from user in daily operation and maintenance. Adequate supply of animal dung (4 to 13 bovine heads) and water are prerequisites to ensure generation of biogas in sufficient quantity to fuel cooking.

The multiple benefits, households reap justify the extra effort required in running the unit and in its care and upkeep. Cooking with biogas is again close to traditional cooking in that the user can experience heat from flame, use of a stove and traditional pots for cooking with little variation in cooking time and meal habits. Community biogas units may make the community more close knit if managed and handled properly, as when run on a cooperative basis there is collective efforts directed towards a common cause. The major factors in successful operation of domestic/community biogas unit is the availability of dung and water throughout

the year and infrastructure to maintain the same. In addition to fuelling cooking it can serve lighting needs of the household as well.

Biogas technology helps in generating economic benefits in terms of saving firewood and chemical fertilisers as well as balance of payments generating employment besides social benefits like clean, healthy and sanitary cooking environment, reduction in drudgery to women and children, better soil fertility and less pollution. Alongwith biogas technology, dairy farming, too need to be promoted to ensure continuous feeder stock supply.

Women's Development and Emerging Renewable Energy Technologies

There exists vital linkages between technology, human being and nature which are channelised and accelerated through effective flow of different energy forms. Rural development is a strategy designed to improve the conditions of 52 crores of people living in 5.67 lakhs villages. Development results through change and adaptability and through the creation and use of human and material resources. The transformation process in reality begins with the people themselves, their problems, their needs, their motivations and their aspirations. Any technology used as a means to development should increase productivity, improve working conditions form a way of life, merge with culture and social traits, ensure economic benefits, involve the participation of the potential beneficiaries in all phases of technology development, transfer and use and be ecologically sound and compatible with tradition.

Emerging cooking technologies can be viewed as appropriate means for women's development in addition to upgradation of environment quality. Economic independence, even partially and roles in making decisions of direct concern to the women empowers her and helps her overcome any apathy, self dejection or phobia she may have. A desire ought to be generated amongst women to seek possibilities of improving work environment within and outside their homes whereby they can increase their productivity. It should dawn on them that while they are puffing at traditional chulhas, elsewhere their counterparts are indulging themselves in microwave cooking. Though microwaves and cooking gas stoves are beyond their reach, there are equally good cooking technologies (ecologically, environmentally, drudgery relieving) like Solar Cookers, Improved Chulhas and Biogas Stoves which they should opt for. There need be no two opinion about the utility of these to women.

Though women are the primary participants in cooking fuel cycle, rarely they are the decision makers in related matters. They work with the crudest of tools for completing their tasks. By and large their men exhibit little concern regarding the tools and technologies with which they accomplish the multitude of tasks in supporting life or her household of which cooking is the major time consuming task.

It needs to be brought home to women (rural/urban) that they are no less in potential for development and it is only the society and they themselves, that bar their participation in development. In other

words, it is necessary to remove social barriers through their active participation in development acitivities.

The women need to be given the necessary information input to critically assess their existing cooking technology and fuels to decide and effect change. Once change is effected, they should become competent to repair and maintain it.

The care and maintenance of these are often left to men because of which they suffer a set back. Often they get assistance not when needed but when their men consider it fit. Tradition and social barriers need to be broken. This can be achieved only through training.

Cooking technologies are primarily used by women in all cultures. But in its development and transfer the role of women has been very little. Rural women do not express their right to choose. Women can be a powerful tool to free women from a lot of hardship in cooking, save their time in fuel collection and cooking,enable them to take active part in skill development programmes and income generating activities. It is necessary to examine and see the extent of involvement of women as decision makers, promotors, self employed workers in transfer of energy technologies for cooking which is a major task that absorbs more than 50 per cent of the household work hours.

In solar cooker programme, biogas programme, chulha programme, the involvement of women at different phases has been practicaly very low. This could be one of the reasons for its low success. Their participation in development process is minimal for want of skill, time and due to fatigue and social restrictions and personal inhibitions.

During the period when land is lying fallow in anticipation of monsoon women are a little freer and this is the time for planning community outreach programmes for them. This normally falls from mid March to June and coincides with completion of reports and the slack period before the tasks are taken up in the new financial year for most of the national programmes. Women are receptive to skill development programmes whereby they can contribute to household income and family well being. However it needs to be provided at times when they are free and should be linked to immediate, visible/tangible benefits.

These three emerging energy technology options ideal as cooking technology have passed well beyond the experimental stage and we can say that these are somewhat mature technologies which need nominal modifications to make it user appropriate. These are taken up as national programmes in view of its potential to conserve biomas ensuring clean cooking and frugality in fuel use contributing to better quality of life.

Nearly 60 lakh improved cookstoves, 11 lakh biogas units and 1.5 lakh solar cookers are promoted so far under national programmes (DNES, 1989-90). The economics of using solar cooker against wood/dung burning chulha kerosence stove and 'Sigdi' using softcoke assuming two meals per day are cooked in the cooker during 260 days in a year and that

of improved chulha against conventional chulha using fuelwood and dungcake for 365 days are estimated (Table 1). The findings presented brings to limelight the saving in momentary outlay in purchased fuels and saving on biomass and commercial fuels like soft coke and kerosene possible per solar cooker and per improved cookstove. The magnitude of the positive impact can be understood when savings is worked out for large number of households if SCs and ICs are used to the optimum.

It is needless to mention here that a chulha is put to other user other than cooking and the economics worked out here is only for preparing a standard meal planned for the experimental study. The health benefits due to smokeless cooking, time saved in fuel gathering and the like are over and above these tangible benefits.

Transfer of Emerging Energy Technologies

The policies related to energy programmes assume significance in this context. The focus of our energy programmes should not be merely to instal certain number of biogas units or improved chulhas or distribute certain number of solar-cookers (target oriented approach) but should be directed towards creating sustainable development models wherein energy and other infrastructure to meet essential needs, generate job opportunities, improved education and productivity both agricultural and industrial, better sanitation, hygiene, health and nutrition, repair and maintenance of these in a decentralised manner and cater to social, cultural and mental development in an appropriate milieu are available.

The energy intervention programmes should not be an end in itself but should be a means to achieve rural growth and development in its true sense with the physical and emotional involvement of the rural community in the process of identification of existing resources and creation of new resources.

It is imperative here to consider the factors that would act as facilitators or constraints in a programme of cooking technology transfer as those of solar cookers, improved chulhas or biogas units.

Cooking is not a new task as it has been practised by man since millenium though the cooking devices introduced are new and the fuels in some cases are new. To deviate from any traditional practice/ habit means to bring about change. To bring about change it is necessary to unfreeze the old elements, learn and accept the new level and this implies management, determination and commitment. If the benefits of the changed situation are visible/tangible to the actor, then change can be brought about more easily. In order to bring about change therefore it is necessary to analyse the practice, the new element (cooking unit and fuel) and the changes required within the socio economic millieu of the actor (beneficiary/user) of the technology. Many socio-economic factors come to the fore along with tradition/habits. To break tradition requires the support of various factors like the immediate family, need of the community and the society.

TABLE : 1

Economics of Cooking Two Meals Per Day on Improved Chulha Vs. Conventional Chulha and Solar Cooker Vs. Conventional Cookstove

Fuel Type	Fuel Consumption In			Cost per kg fuel (Rs.)	Savings Due to Improved chulha		Savings Due to Solar cooking on 260 days	
	One Meal (kg)	Two meal per day (kg)	365 days (kg)		Fuel (kg)	Outlay (Rs)	Fuel (kg)	Outlay (Rs.)
Fuelwood @								
Traditonal shielded chulha	1.870	3.740	1365.10	1.00	–	–	77.00	778.00
Improved chulha Twopot Mamta	1.170	2.340	863.00	1.00	502.00	502.00	488.00	488.00
Dungcake @								
Taditional shielded chulha	2.600	5.200	1898.00	1.25	–	–	1082.00	1352.50
Improved chulha Twopot Mamta	1.800	3.600	1314.00	1.25	584.00	730.00	750.00	937.50
Soft Coke **								
'Sigdi'	0.265	0.530	193.45	4.50	–	–	155.00	697.50
Kerosene**								
Wickstove	0.172*	0.344*	125.56	3.00*	–	–	102.00	305.00

@ R & D, TBS Unit, 1990
** George, R., and Ogale N., 1987

In-built Component of Economic Growth

Any of these technology programmes should have an in-built component of economic growth. It is needless to mention that Solar Cooker distribution leads to earning commission, improved chulha production in pottery generates income to the potter, its installation gives an employment opportunity to the chulha maker (Self Employed Workers) and similarly biogas unit construction too gives rise to job creation. Repair and maintenance of components too essentially create employment. In spite of this we do not have a steady skilled work force retention in all these cases. The trainee identification, the remuneration delivery system, the service delivery system from the chulha maker/biogas construction worker (mason/supervisor) and the monitoring system should be streamlined to sustain the motivation and commitment of the worker in each case.

The technologies trasferred should meet nearly all the functions served by the traditional one which it is to replace. Therefore an insight into the purposes served by traditional technology and the flexibility possible through new technology needs to be established before venturing into its application/transfer in the field.

Understanding Local People and their Lifestyle

Before entering into a region with the idea of transfer of these technologies it is necessary to understand the prevalent social economic and power structures, the traditions, customs and cultural patterns centering around fire, stove and foods, decision making bodies, key/contact persons, model/catalyst change agents, superstitious beliefs, inhibitors, energy crunch/shortage/scarcity in the area, potential energy sources, education level, motivation levels, enthusiasm, basic attitudes, prejudices, preferences and the like.

Understanding socio-cultural milieu is important to plan appropriate entry with the idea of the technology. Need/desire for the technology should come from the people as they face the problem. Do not impose any of the technologies as appropriate but throw an idea and generate a desire to experiment with the idea so that the technique is something conceptualised together. Install demonstration model for people to see and experience, learn from failures and improve upon them. Generalise the cultural patterns only on the basis of a number of similar observations. Existing cooking practices and relevance of a kitchen inside and outside, cooking position of the cook (standing/sitting) and the number of persons for whom cooking is done are worth studying to decide on the sitting and model of stove. Social restrictions too should be understood to involve appropriate worker by gender. Language should not be a barrier in communicating with target group. Involve key decision makers and women too at various levels of decision making. In our experience we have found that mother-in-law plays a vital role in decision making though the daughter-in-law may be the cook who works at the stove - yet she has no say in decision pertaining to the stove she will operate.

Taboos and rituals revolving around fire should be understood. The difference between rich and poor in a community needs to be clearly studied. Enter a community through known people who are held in respect by the community. Live with people, understand them, their culture and win their confidence. Be very patient to get good results.

A consumerist model may not be appropriate to promote these technologies as here the emphasis would be product centred and not human centred. Promotion and disseminations of these emerging technologies require raising public awareness, setting up an approach, training centres and involvement of users particularly women. Local women could be used as motivators, demonstrators or extension workers and promoters.

Community participation in problem identification, selection of solution and application of solution is important for the success of the problem solving process. Acceptability of a solution increases if it is not imposed. The promoter should address the issue pertaining to energy crisis, which is most relevant for a community. Each of these emerging technologies should be advocated as per the needs, use, viability/feasibility and appropriateness to user. To a particular group ICs would be the best while SC would prove to be inappropriate. Biogas units if installed in dry zones would be a waste. Highlight on points relevant to each target group like smoke removal, time saving, durability, cost, ease of operation, money saving, aesthetics, fuel conservation and manure generation and so on. A participatory model wherein the target group members/representatives are active participants in decision making would in the long run lead to a self sustaining stage in each of these.

Training

The users ought to be demonstrated cooking and fuel management so that they learn by seeing, the art of operating the IC or SC or biogas units which are different from traditional cookstoves. Transfer of these technologies implies development of skilled manpower which out of necessity means organisation of training programmes. Trainers of trainees are required. Trainee selection is crucial so also is the content of the training programme to ensure quality chulha construction or transfer of technology, user training and education, repair and maintenance in the field.

Demonstration and training are key to successful operation of the technology by its potential user. The primary objective here is to expose the potential users to the new technology. First exposure need to be well planned and of the best quality as it is very critical. The audience need to be convinced of its benefits. Once it fails to make an impact it is difficult to overcome initial resistance. Tall claims should not be made as disappointment after using would lead to loss of faith and rejection of the technology. Live demonstration and an opportunity for the audience to experience working at it enhances the understanding of the potential user.

Women being users should be trained to build (if possible), care and repair these as well as identify problems and its causes.

Followup and Monitoring

Infrastructure facility need to be created in the village itself to tackle problems that arise in the process of transition from traditional to emerging new technologies. A skilled workforce to motivate, install, repair and maintain these technologies thus is an imperative at the village level. Monitoring and supporting systems at block and district level will strengthen the programme. Followup is necessary to assess responses, modifications, boost morale of users and chulha makers and sustain motivation of users.

These technologies have tremendous potential to improve women's lives, quality of environment and life of the household. But if badly delivered it can make people shy away from it for a long time.

Subsidy

Selection of site and the mode of introducing the technology are crucial to its effective dissemination. No cost or heavy subsidies are constraints to effective use of any technology at national level as it devalues the credibility of the technology. However as a promotional strategy a nominal subsidy can be attached to it and this could reduce the shock when subsidy is withdrawn at a subsequent time.

Our recent experiment in IC would be worth sharing here. As an experiment TBS Unit, Baroda introduced the concept of Improved Chulha to urban slum dwellers who had expressed their concern regarding increasing cost of kerosene and scarcity of free fuelwood. The women felt the need to conserve and the idea of IC was thrown open to them and they were told the cost sharing pattern i.e., if they share the cost of chimney (Rs.35/-) then pottery lined chulhas would be installed in their houses free of charge. Approximately 50 per cent cost is borne by the beneficiary. They were exposed to the options or choices available and they made their own decision pertaining to the model of chulha (Mamta Single/Double Pot Chulha) they would like to opt for. the chulhas were then installed and they are using it since last two months. In the same slum single pot, two pot small and medium size ICs are installed. Now it is too early to comment on its continued use. But chances are bright that they would continue using it or approach us if they face any problems as they have purchased the chimney pipe and a value is added to their possession. The smokelessness in cooking is well appreciated by users in addition to fuel and time saving. In this instance there is people's participation and value attached to the technology. Yet another strategy could be where the users would bear the cost of entire set of hardwares - chimney and pottery components - liners, cowls, tunnels etc. The expected survival rate of the technology is more. Nearly 90 per cent of the cost is borne by the user and the value of the chulha is high. Attachement and the feeling of owning it is more. Hence the tendency to care for it is likely to be more. The technology in all the cases should meet their requirements as close as their traditional ones. The pottery liner production is a commercially viable item. Once a user adopts an appropriate IC in

daily cooking, then she would not like to go back to her traditional stove. Under such a situation in case she desires a replacement to chulha liner after some period of use, say, a few years, then she can purchase it from the market. The technology becomes self sustainable. TBS Unit, Baroda is intending to field test this strategy shortly. The Unit provides reducer rings (pottery) along with the stove to increase the flexibility of the use of pot hole to use vessels ranging from 15 cm to 28 cm or 15 cm to 32 cm in diameter depending on the model of chulha, viz. Mamta/Priya Chulhas (Annual Report, TBS Unit, 1988-89).

Post Training Support

Post training support is equally importants to back up regular training programme in developing skilled work force to handle these technologies. Experience away from site in hypothetical situation (laboratory/premises of training institute) is very different from pratical experience at site under the supervision and guidance of experienced trainer/officer. Trainer or supervisor should be a good teacher and quick to make adaptations for location specific needs. All field level functionaries cannot be trainers. Trainees/grass root level workers should be held responsible and accountable for their work. Unskilled/untrained/non committed persons who know little about design parameters, working principles, merits/demeritis, limitations of each technology, changes needed and the like should never be involved in the transfer or promotion of these emerging technologies at any cost. Such persons can kill a programme and this is precisely the major contributing factor for the failure of these technologies, if any, in the field.

Scheduling of targets, timely placement of orders and proper management are crucial to the success of these technology transfer programmes. I am reminded of the monitoring survey we did sometime ago. We found that the mud body of the chulhas where installed without chimney and since then a couple of months had lapsed without any further developments. The beneficiary households got tired of waiting and they started using traditional mode of cooking. In such instances the credibility of the worker and implementing agent is questionable. The whole programme would suffer a set back because of a particular implementor. In installation and in payment to chulha-makers bureaucratic delay should not occur as delayed work can demotivate its users and SEWs/chulha makers. Local power structure should not be by passed under any circumstance. Efforts to understand village politics and play accordingly would pay dividends in the long run.

In technology transfer programme of this kind, various levels of personnel with varying backgrounds are involved. To mention a few are engineers/technocrats/scientists, bureaucrat, social scientists, trainers, extension workers, artisans/grass root level workers, and users. Appropriate means of communication hence is very important. Often those who draw policies/strategies are well versed with it while those who manage at local level have little insight. This would jeopardise the programme. The attitude and ideas of policy makers, planners, designers,

scientists and consumers need to be attuned to facilitate interfuel substitution and use of an appropriate alternative energy and•technology for a give end use instead of continuing the use of conventional technology for personal gains and reasons.

Pricing structure of conventional fuels ought to be made such that it automatically forces consumers to make the necessary shift. A study on consumer behaviour with reference to energy forms has shown that users are willing to change energy consumption behaviour to conserve energy only if it impinges on their purse.

Conclusion

In the prevalent energy context the household can either continue their lifestyle in haphazard manner disregarding limitations of biomass or can be forced to change behaviour through highly controlled systems established and regulated by government or can be assisted to change their behaviour voluntarily through increased individual responsibility. To exist beyond mere survival the best option would be increased individual responsibility coupled with government intervention programmes. This would ensure smooth transition.

In the case of these emerging renewable energy technologies, switching over from one technology to another for the same energy form (from traditional chulha to improved chulha) would be easier and faster if implemented in the ideal manner than from one technology to another powered by an entirely different energy form (from traditional chulha to solar cooker).

Centralised energy system in these cases may not be ideal due to various reasons. To offset the problems associated with centralised energy systems, and to make each site - village - a sufficient, self sustaining unit in energy supply - decentralised energy planning and management are appropriate. Decentralised energy systems function independently matching energy supply to demand taking into consideration geography, metereological environment, socio economic background of the people, their education level, biases, prejudices, beliefs, customs and so on. This is conducive to ecological and environmental upgradation. Local people should be involved in decision making with the assistance of expert consultants. Each site should have adequately trained manpower to plan, install and look after the various systems. The technology systems introduced should be compatible to the capabilities of the community so that in addition to opting for the same, they can operate and maintain it too. This would lead to village autonomy and self sustainable development which should be the ultimate goal of any development programme.

Marketing of these energy technologies is very important. A ready market does not exist as of today. Hence large entrepreneurs may not enter into production leaving the challenge to small scale industries which may not be very much committed to maintaining quality without external pressure. It is therefore necessary to evolve ways and means of

motivating reliable well established manufacturing units to enter into production of these technologies.

Cooking is a female oriented task. Men being the decision maker and dominating factor in Indian social set up, should feel the need for improving household cooking technology and support their women to switch over to these emerging technologies. If focus for energy conservation is shifted from domestic cooking to industrial application then women's needs would be relegated to the background. Biomass conservation programme should focus on women.

The cost benefit analysis in social and economic terms clearly shows that the benefits of any of these technologies taken independently or together outweighs the cost and hence an attractive option to curb ecological imbalances and contribute to women's development as well as overall development of the community.

An integrated energy system wherein due recognition is give to existing socio-economic, cultural and psychological milieu, and options on fuels and technology are available should emerge as an ideal choice which would lead to a revolution in the lives of the masses that would change the face of communities giving rise to better sanitation, greenary, beauty, better health, less pollution, higher incomes, less hardship and better well being and welfare - development in true sense.

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Integrating Renewable Energy Technologies with Production in Agriculture and Rural Living - A Case Study

by

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Background

In order to develop energy and plant nutrient supply systems and their management practices suiting to different sections of rural community in an identified village, Operational Research Project on Integrated Energy and Nutrient Supply System was initiated at CIAE, Bhopal in March, 1984. An Energy Census and Resource Assessment Survey was carried out in 1981 to assess the energy use pattern by different categories of farmers for production agriculture, post-harvest operations, cattle raising and domestic activities (Maheswari, R.C. et al., 1981). In our study the village Islamnagar had 224 households with a total human population of 1529 and total livestock population of 1436. Out of 16 TJ of total energy used in the village, the crop production accounted for 0.49%, livestock raising accounted for 0.8% while the major theme of 83.76% went to the domestic sector (mainly for cooking).

The village was surplus with regard to cereals, vegetable, sugarcane and milk. However, there were deficit with regard to fuelwood by 20% (98.8 tonnes), cattle feed by 30% (812 tonnes), oilseeds by 71% (23 tonnes) and pulses by 32% (7.2 tonnes). Out of 46,000 TJ of solar energy received by the geographical landmass (717 ha) of the village, only 40.44 TJ is converted into food; feed, fuel and fibre. In order to achieve this conversion, 0.27 TJ from chemical fertilizer, 0.37 TJ from machinery, 0.46 TJ from diesel and 0.16 TJ from electricity are consumed as illustrated in Fig.2. The aforesaid energy census survey has become the basis for planning and implementation of the village development based on alternate and renewable energy sources for achieving the self-sufficiency in fuelwood, fodder, pulses and oilseeds

production and its processing at village level. This was the Gandhian concept fifty years ago.

The survey of resource availability and consumption patterns has identified the area of deficiencies and excesses in the village ecosystem. Even before independence, the Gandhian Philosophy had advocated to make the village self-reliant at the village level itself. Forty or fifty years back, economic conditions were not ripe for its success, whereas in today's economy and development in India, such efforts have much greater potentiality to bear fruits as demonstrated in this paper.

Presented in the present document are the planning, implementation and to some extent, monitoring, of the above mentioned self-sufficiency plan with regard to fuelwood, fodder, pulses and oilseeds based on renewable energy sources.

Planning for Self-sufficiency in Fuelwood Supply System

The daily per capita consumption of fuelwood and dung cakes for cooking in the village amounts to 0.85 kg and 0.88 kg, respectively. Thus, village consumes 474 tonnes of wood and 448 tonnes of cowdung annually for cooking. Besides augmenting the fuelwood supply, attempts have been made to reduce the demand of fuelwood and cowdung for cooking by (i) improving the thermal efficiency of wood stoves, (ii) installing the individual and community biogas plants. It has been estimated that 50 individual and community biogas plants (4 to 8 cum capacity) and three community biogas plants of 85, 35 cum capacity would be able to meet the NPK requirements of crop production by 28% (so far, 42 individual and two community biogas plants have been commissioned in the village. Out of 224 households, 150 houses have been provided with smokeless stoves). In order to remove the twenty percent deficit of fuelwood the planning is as under:

(i) Total annual deficit	:	98 tonnes
(ii) Annual tree yield	:	4-6 kg/year
(iii) Number of tree required (assuming kg/tree/year)	:	20,000 nos
(iv) Number of tree to be planned (assuming 50% mortality rate)	:	40,000 nos
(v) Number of tree to be planted/ha	:	1000/ha
(vi) Area required for plantation	:	40 ha
(vii) Area available for plantation	:	61 ha

Planning for Self-sufficiency in Fodder Supply System

The village ecosystem carries a total animal population of 1353 numbers (excluding poultry birds) and has a pasture land of 132 ha. The total fodder available on dry weight basis is 129.3 tonnes of berseem, 1186.3 tonnes of grasses and 662.4 tonnes of crop residue amounting to 1928 tonnes of fodder. However, the requirement of fodder on the basis of standard feed requirement works out to be 2740 tonnes (dry weight). Thus, there is a

shortfall of 29.65%. The above shortage can be overcome with the following planning:

(i) Animal fodder deficit : 812 tonnes

(ii) Available land for pasture development : 132 ha

(iii) Potential of high yielding grasses 4 t/ha : 528 tonnes

(iv) Grasses from afforestation land at the rate of 2 t/ha (40 ha) : 80 tonnes

Planning for Self-sufficiency in Pulse and Oilseed Production

The village has 224 households with a total population of 1529. Presently they consume about 245 tonnes of cereals, 25 tonnes of pulses and about 14 tonnes of edible oil annually. Considering the standard diet as per the National Institute of Nutrition, the production system is presently deficient in pulses by 32% and in oilseeds by 71% and is surplus in cereals.

The reallocation of land in the village Islamnagar based on the land use planning prepared by the NBSS & LUP, Nagpur (Deshmukh, 1983) has been done by using systems engineering approach to make the village self-sufficient in pulses and oilseeds.

The survey of resources availability and their utilization has shown the scarcity of irrigation water in the village to the extent of 28 per cent. To overcome this problem, installation of 6 units of hydram lift irrigation system of Patra river has been planned and the renovation of the existing water harvesting pond 11.33 ha-m capacity is being carried out. A package of energy efficient implements and tools has been worked out for the village as a whole to increase the yield through tindiness of operations.

Implementation and Monitoring of the Programme

Installation of 50 individual biogas plants of 3.5 a.m./day average capacity and three community biogas plants of 35, 35 and 85 cum/day capacity would produce 72270 cu m of biogas and 578 tonnes of farm yard manure from the biogas slurry. The biogas generated would meet 58.2% of cooking energy requirement. On the other hand, 9.25 tonnes of nitrogen, 1.73 tonnes of phosphorus (P_2O_5) and 2.45 tonnes of potash (K_2O) are required at the level of self-sufficiency in crop production (Fig 3). So far, two community and 43 individual biogas plants have been installed in the village and 150 houses have been provided with smokeless stoves. To cover 20% fuelwood deficit, energy plantation on 25 ha land at the hillock has been developed. This has led to the protection of more than 10,000 existing root-stocks of 20 species of trees. The village has 132.7 ha of pasture land and planting of high yielding grasses and fodder under social forestry programme will cover 70% of the deficit. During the first phase, an area of 10.72 ha was taken for seeding with *cenhrus setigerus* and *cenchrus cilliaris* grasses and an area of 0.98 ha was transplanted with *cenchrus setigerus* grass

seedlings and adopted for silvipastural farming system. 80,000 Napier grass slips were brought from BAIF, Urli-Kanchan (Maharashtra) and a nursery has been raised.

Land in Islamnagar has been reallocated on the basis of the land use planning done by the NBSS&LUP, Nagpur, by adopting systems engineering approach to make the village self-sufficient in pulses and oilseeds production. Efficient soil and water management planning forms the basis for increasing production and productivity. In addition, a package of improved tools and implements has been adopted for the village as a whole.

The survey of resources availability and their utilization has shown scarcity of irrigation water in the village. Only 14.5% cultivable land is under irrigation at present from the existing sources of water. To overcome this problem, installation of hydram lift irrigation system on Patra river has been planned and installation of three units of 12 ǒ 2.5 in size double pipe hydram has been initiated. Renovation of the existing water harvesting pond of 7.14 ham capacity and installation of additional tubewells have been planned and measures have been taken. The drainage system has been designed and its execution is underway.

Implementation or various programmes for making the village self- sufficient has led to better resource utilization and increased harnessing of solar energy for its conversion to food, feed, fuel and fibre. The original and changed scenario with regard to solar energy flow in the village ecosystem in our study shows a rise from 40.4 TJ to 67 TJ and the overall photosynthetic efficiency goes up from an average of 0.0868 to 0.144%. It is also true that when the ecosystem becomes a surplus one in terms of food, feed and fuel, the actual energy requirement goes down from 16 TJ to 15.5 TJ. This has become possible through (i) reduction in wasteful use of thermal energy with traditional stoves and achieving higher thermal efficiency with the use of gas burners for the biogas, and (ii) harnessing of solar energy for additional fuelwood and grass production.

The employment potential in making the village self-reliant through production agriculture, post-harvest operations and animal raising activities also goes up by about 1,00,000 man-hours (12,500 man-days). In addition to removal of drudgery in the domestic sector to the extent of 1,45,500 man-hours there and grasses (79,000 man-hours) development programmes. Thus, there is additional generation of 12,500 man-days in a year in the village. To manage the renewable energy technologies, a housewives society, named as "EKIKRAT URJA, POSHAK TATVA EVAM GRAMIN VIKAS MAHILA SAMITI" has been organized in the village and registered with the Registrar of coppoeratives. The Samiti has raised an amount of Rs.10,000 to repair and maintain the biogas plants.

The impact of all the technologies introduced on the productivity of the land and income of the farmers has also been assessed.

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Intitutional Aspects of Rural Energy Programmes

by

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Rural energy planning has become a prominent issue in India in recent years. The need to plan for energy supply has been recognised by the government after the "oil shock" of early 1970s and the growing concern about the rate of deforestation and its deleterious effect on the fuel supply situation as more than 75 per cent of rural energy is contributed by woody biomass alone. Therefore, the government launched in early 1980s, in addition to the ongoing rural electrification, several energy development programmes. These include community forestry, family biogas plants, community biogas plants, improved cookstoves, solar devices and wind energy. National level projects involving huge investments and elaborate planning were initiated for promoting these projects.

However, in spite of these impressive inputs, most of the programmes had achieved only limited success. Though several reasons like centralised planning, target orientation, poor infrastructural facilities, financial inadequacies have been cited, poor institutional arrangements has been one of the most important reasons leading to poor implementation and consequent failures. The objective of this brief paper is to study the institutional aspects relating to rural energy programmes (REPs) and to examine how they affect the programme implementation. The National Project for Biogas Development, one of the largest energy technology dissemination programmes promoted by the government, has been used to illustrate various aspects.

What are the principal institutional aspects relating to rural energy programmes that have an influence on their performance?

First of all, rural energy programmes, unlike a thermal or hydro power plant which is situated at one place under a centralised control, have a wide geographical spread involving hundreds of thousands of people. Therefore, absolute control of such programmes cannot be in the hands of a single agency. For instance, nearly 1.3 million biogas plants have so far been installed under NPBD in a decade covering nearly all the states and Union Territories in the country.

Secondly, the main goal of the REPs is to directly meet the needs of individual users and hence, the planning effort is actually at the household level. For instance, to determine the energy needs of the family, dung supply capacity and financial requirements. This involves considerable efforts by the implementing agencies.

Thirdly, most of REPs are promoted mainly for social benefits (arresting deforestation through reduced energy demand, providing clean, efficient fuel, etc) rather than financial benefits for the individual family. Thus, motivating the beneficiaries is an important aspect of the implementation. Therefore, financial incentives and education play an important part in creating demand for REPs. This requires proper infrastructural and training facilities within the reach of the beneficiaries.

Finally, implementation of REPs requires active involvement of various groups like different government departments at national, state, district and block levels, non-governmental organisations, financial institutions, manufacturers, research and education institutions, village level organs (Panchayats) and individual beneficiaries. This means that a very high degree of coordination is required if REPs have to be successful. The matrix shows the complex organisational arrangements of NPBD.

However, in spite of such elaborate organisational structure, NPBD has not achieved the kind of success expected. Some of the organisational problems identified as reasons are:

a. At micro level (block and village), the responsibility of implementing the programme has been entrusted to regular government departments like DRDA, Forest Department, etc., which normally implement multiple programmes. Consequently, there is tremendous pressure on the functionaries and it is difficult for them to pay special attention to any of the programmes.

b. Since the emphasis has been on target orientation, that is to complete a certain number of plants in a financial year, training, one of the most critical requirements, has been neglected. This resulted in poor construction undermining the people's confidence in the technology.

c. No attempts have been made to create any organisation at village or block level to provide post-installation maintenance service and monitoring of the working plants. This has seriously affected their performance.

A Typical List of Interest Groups in NPBD

Level	Group	Orgns/Depts.	Functions
National	Agricultural Finance Commission	Planning Commission, Various Ministeries, CASE, DNES, NABARD	Policy Making Budget allocation
	R & D Instiutions	Universities, IITs, RRLs, etc.	Thrust in R & D
State	High Powered Committee	Chief Minister, Ministeries, Secy (Agri), MD (Agro Ind)/ Nodal Agency.	Target fixation
	Executive Committee	Director (Agri), DCs, KVIC, Agri Engineer, etc.	Overall execution, Raw material supply Monitoring, etc.
	Coordination Committee	Secy (Agri), NABARD, Commercial Banks.	Loaning facilities, Distribution among banks
District	Coordination Committee Committee for Fixation of Rates for	DC, CEO (DRDA) Commercial Banks DC, CEO (DRDA), Asst. Agri Engineer, Asst. Soil Conservation Officer, Dty. Director (Agri).	Loan processing Progress review Fixing rates for fabrication of gasholders, Approval of fabricatiors to various banks.
Block		BDO, Agricultural Inspectors, Khadi Board, Banks, etc.	Motivating users Service delivery Quality control Target achievements.
Village		VLWs, NGOs, Panchayat Beneficiaries	Motivation, Facilitation

d. Coordination was poor among the various organisations involved in the implementation of the programme which caused delays in supply of raw materials like steel and cement and also disbursement of subsidies and loans.

e. No proper feedback mechanisms has been developed so that target fixation could be rationalised on the basis of the past performance. Functionaries at micro level have not been trained for this purpose.

f. R & D organisations working in the field are mostly confined to laboratories, so there has been no orientation as to what the actual needs of the programme are.

g. Since most of the potential beneficiaries could not perceive the economic benefits, considerable educational efforts are needed to motivate them. But due to inadequate manpower and training, this has not happened. The involvement of voluntary organisations, which would have redressed this situation to some extent, has not been up to the expected mark.

Although the above factors are mentioned in the context of NPBD, the observations made are relevant to all the REPs. Therefore, if REPs have to be successful in meeting the local needs in a sustainable manner, some of the following suggestions will have to be adopted.

a. The analysis of the implementation processes of REPs shows that planning for REPs has to be decentralised. That is, institutions and mechanisms capable of designing and managing energy development programmes have to be developed at micro level with organisations at state and national level playing a coordinating and supporting role to provide technological and financial inputs. Encouraging the participation of more voluntary organisations will have a positive effect.

b. Targets should be fixed for a region after determining the capacity of that region to absorb a particular technology in a certain time period. For this, a close study of the region in all its aspects is necessary and only a decentralised set up is capable of achieving this.

c. Proper integration of energy needs with the development priorities of the region is necessary for ensuring success of REPs. If people do not perceive energy as a top priority, the propagation of REPs will be that much more difficult needing more efforts.

d. On the organisational side, efforts should be made to achieve better coordination among various agencies involved so as to ensure smooth functioning. Efficient Management Information Systems (MIS) should be developed for effective feedback on the performance of REPs. Special

attention should be paid to training and information needs of various interest groups in the REPs. Compact main-tenance and monitoring mecha- nisms should be developed.

e. Education to the *beneficiaries often proves critical in the success* of REPs. Special attention should be paid to this.

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Renewable Energy Programmes - An Assessment of the Prospects

by

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1. This paper seeks to make an evaluation of the prospects of the renewable energy movement in the light of my own experience as the Chairman & Managing Director of the Tamilnadu Energy Development Agency and goes into certain policy questions relating to the scope and the limitations of the renewable energy programmes presently administered by the Government of India in the Department of Non-Conventional Energy Sources and by the various State Governments through their respective nodal agencies. This paper is not descriptive of the various programmes in this connection and does not abound in information or statistics except where strictly needed.

2. This writer is of the view that, before we discuss the question of administrative or other implications of renewable energy programmes, it is necessary to discuss the question of our readiness to accept the concept itself.

3. It is granted, that in the context of the growing energy crisis, the growing concern for environmental consideration, the increasingly difficult supply and demand position with regard to energy consistent with the growing developmental requirements, the search for renewable energy resources and their commercial utilisation has assumed enormous significance. The main goals therefore are - to pursue actively and vigorously, at national, state and local levels, the possibility of identifying and locating renewable energy resources and by utilising them in an optimal manner by the adoption of an appropriate technology or technologies in order to meet the variety of energy needs of the community.

4. The first task is to define the goal at the national level, break it into

components, translate it into programmes, fix—interse priorities, provide adequate finance for the various programmes, select appropriate national and field level agencies for implementation and monitor the results of the programmes, constantly keeping in view the need to provide for technology upgrading so as to increase the efficiency levels of the utilisation of renewable energy resources, particularly in the rural areas.

5. The writer's submission is that all these have to be spelt out in national policy on renewable energy programmes fixing a clear time limit for the implementation. It is high time that we had such a national policy. The national policy will help the national policy makers as well as planners to understand and appreciate the value of the programmes and to commit themselves to these programmes so that there would be no difficulty in funding the programmes or in providing the needed organisational or logistic support.

6. Remarkable work has been done in the promotion of the concept of renewable energy resources during the last few years by the Department of Non-Conventional Energy Sources of the Government of India and notable success has been achieved in the areas of wind energy, biogas utilisation and the like but these are piecemeal successes which only underscore the fact that given the proper thrust in terms of policy direction our country can achieve much better results in other areas of renewable energy resources. What is needed is a total appreciation of the role of the renewable energy resources and a commitment to the cause of their promotion. However judging from the volume of funds provided by national and state planners and the administrative machinery which is available for implementing the various programmes anyone will come to the conclusion that lot more remains to be done in getting the whole concept accepted without reser- vations.

7. The projections of the country's energy requirements by the end of 2000 A.D. will call for financial investment of staggering magnitude for electric power generation, coal mining and transport and the production and import of petroleum products. Rightly all our planners are exercised over the question of finding these resources. The talk of mega investments, international and bilateral assistance is really impressive and makes one feel with a sense of anxiety that the role of the renewable energy resources in this race will be minimum.

8. The writer's main worry is not so much about the provision of an adequate amount or funds for the programmes, because funds themselves should not be a problem since in the current context renewable energy resources will demand and absorb the volume of funds which the nation can certainly afford to provide. The main worry is the real possibility of the marginalisation of our own approach to the concept and the strategy for development of renewable energy resources in our country.

9. One additional point to be kept in view in this connection is that the renewable energy development to meet location specific energy needs and individual consumer oriented patterns is justified, perse on the basis of a systems

approach and not merely as an appendage or supplement to an environmental health programme. There should be no mixing of objectives here. That will be the real strength of the renewable energy programmes.

10. In other words, they are not supplement to or substitute for massive power generation programmes or are an answer to environmental issues.

11. The renewable energy scenario is most aptly discussed in the rural context, where the high status enjoyed by these resources to meet fuel and other requirements is bound to undergo change over a period of time consequent on economic development and where if we do not have to create difficult condition we could bring about upgrading of technology resulting in improved utilisation of the existing resources, a problem which can be solved with commitment to certain logical priorities. The prevailing situation in the rural areas throughout the country (Tamil Nadu being no exception) will be somewhat as follows:

(i) Intensity of energy consumption is much lower in the rural areas, as compared to urban areas. Also, relative share of the various consumption categories in urban is basically different from that in the rural areas. In rural areas, household energy consumption dominates the energy situation (80% of total energy demand. 70% to 90% of energy is consumed for cooking and heating), in urban areas, industrial and domestic users are the main consumers of energy.

(ii) A major portion of the energy supply for rural needs is secured by private efforts of individuals at a very low or even zero private cost. Fiscal and administrative controls on energy distribution therefore make little impact in the rural areas.

(iii) A large fraction of the rural population is too. poor to buy commercial energy (including electricity, non-conventional energy technologies, etc.) even when the supply of those are made available. For example, the number of electrified houses and wells are only a small fraction of the total number of houses and wells. This calls for large scale investments through provision of subsidies and incentives to bridge the gap between private and social cost.

(iv) Rural Energy problem has also to be viewed in the overall context of low per capita energy consumption in India which is only about 175 KWH in India as against for example, 8000 KWH in Switzerland. The rural sector contributes significantly to the low per capita consumption of commercial energy in India, even though non-commercial energy consump- tion has been rising.

(v) Rural areas continue to starve for energy and per capita consumption

in the urban areas is more than 10 times that of the rural areas.

(vi) Thus, it is not enough merely to invest more in the production of energy. The energy so produced has to be equitably distributed and utilised to meet the growing developmental needs especially of the rural areas where around 75% of the country's population lives and whose buying power is extremely limited. This imbalance between the development of the rural and urban sectors can be corrected through micro level or decentralised planning for energy through the preparation of integrated area based energy plans.

(vii) Moreover, the Rural Energy problem is multi-dimensional and needs to be tackled through a multi-dimensional integrated approach which would include augmentation of energy supply resources, technology transfer for optimum and productive use of resources, R&D inputs, in particular for developing low cost energy options for the rural poor, education and training for rural users, linkage with various rural development programmes, including village and small scale industries programme, and adequate institutional support.

12. The rural context provides the ideal scenario in which the significance of the role of the renewable energy can be brought out effectively as the least cost solution to the energy problem in many ways. This calls for a systematic analysis of the energy demand, supply position. In each village or group of villages under a viable administrative unit, say, a block or a taluk. Methodology for rural energy survey has been greatly improved in quality and content and such methodology can be adopted to get the necessary data on the basis of which the necessary planning exercise can be done. We have made some beginning in this direction in the Integrated Rural Energy Programme blocks and Urjagrams. Based on the survey and monitoring experience that we have gained in these areas we will have to undertake surveys on much wider areas with special reference to the unique nature of renewable energy resources that may be available in the areas. It is also for consideration whether the survey should be territorial or should be based upon the nature of the renewable energy sources that may be available over a well defined area.

13. Another focus of this survey should have to be the nature of the demand for energy as compared to the supply of energy. Such a shift in the focus will help to plan for meeting specific local energy needs with locally available energy potential. As a result, the demand for energy is not tailored to the available supply. Rather supply of various kinds of local energy can be geared to meet a variety of local demands. This is the chief strength of any renewable energy programme.

14. More R & D work is called for with regard to technology, whether it is windpower for water pumping, chulhas for

cooking, gasifiers for utilising biomass, there is a crying need for technological breakthrough which will really attract the rural people to take to the various applications without giving thrust upon them through incentives or subsidies etc. R & D work should be user-oriented and application-oriented such that the products available in the market attract the users' attention naturally from the point of view of the utility and cost effectiveness. Renewable energy applications must become business propositions and not Government sponsored programmes. The thrust of technology must be to bring about cost effective mass production of gadgets which can provide a satisfactory answer to the use of systems involving conventional energy.

15. This calls for an overall and critical review of the R & D work that has so far taken place in the country and laying down a direction for further R & D works to be completed within a specific time span. There is alarming lack of knowledge regarding renewable energy systems, even simple ones among even the administrators and the policy makers. Their sound education in this regard deserves to be given a very high priority so that in whatever area they serve, they give due importance to renewable energy programmes.

16. Basic to the success of the whole programme is an understanding of the proper roles of these programmes by the whole community. "Conserve energy - Renew energy" are two sides of the same coin. Society, over the years has developed certain insight into the handling of this problem consistent with its social, economic and cultural levels. Owing to scientific progress and technology thrust which are vitally affecting the area of economic development, these social, cultural and economic situations are undergoing a vast change. This is affecting man's attitude towards energy, often producing misplaced sense of direction. It will be necessary to enhance the understanding of the people to this problem and to help them to identify the known resources with which they are familiar and to utilise them better, which will make them depend less upon new resources with which they are unfamiliar. The concept of exploitation creeps in here and man feels alien to his environment developing perverse attitude towards both conventional and renewable sources of energy. This is a big job, the job of restoring the sense of balance and this is the job involving the political, administrative, economic and sociological groups. More intensive studies are called for.

17. It goes without saying therefore that an integrated approach to the problem of development of renewable energy resources is called for. With much less prorata investment on renewable energy resources, it is possible to bring about a much more dispersed energy generation and utilisation programmes. This should be our major task in the coming years. It will call for two most important approaches on the following lines:

On the scientific and technological level the necessary data must be provided and technology transfer encouraged and supported here is a field for close cooperation between the pertaining institu- tions and organisations in industri- alised and developing countries.

Furthermore political visions, national energy supply concepts, economic and strategic advice from professional organisations are indispensable to help to shape such national energy policies. Renewable sources of energy must be taken into account in an overall context and must be regarded as an integral part of our country's energy economy and as a possibility to develop national, country-specific solutions for this overwhelming problem.

19. Only a few issues of policy have been raised in this paper. Details have not been gone into. The approach has to be towards developing the right perspectives. Not the administrative structure, nor the funding could be the problem. Without the right approach there is a danger of the small efforts being made going into waste. A counter productive atmosphere may be developed. The perspective that is needed is to make the renewable energy programme understood and accepted by the people, who are the main users. The implication of the above statement involves having a close look at the current renewable energy scenario, its policies and programmes with a view to settle in the correct direction.

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